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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

New Series.—No. XL.

A BOTANICAL EXPEDITION TO NEWFOUNDLAND AND SOUTHERN LABRADOR.

By M. L. Fernald.

N.Y. BOT. GARDEN
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1. Blanc Sablon from the eastern terraces.

2. Old Stump on the Tablelands east of Blanc Sablon.

Rhodora

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—NEW SERIES, No. XL.

A BOTANICAL EXPEDITION TO NEWFOUNDLAND AND SOUTHERN LABRADOR.[1]

M. L. FERNALD.

(Plates 86–91).

PART I. JOURNAL OF THE EXPEDITION.

IN recent years few lands have figured more prominently in our American papers and in our treaty negotiations than Newfoundland, the oldest of Great Britain's colonial possessions, the largest island in the western hemisphere and, with the exception of Great Britain herself, the largest island in Altantic waters. Nevertheless, although many other British colonies have had their vascular floras adequately worked out in such classic publications as Bentham's *Flora Australiensis* (7 vols.), Hooker's *Flora of British India* (7 vols.), Hooker's *Flora Tasmaniae*, and Grisebach's *Flora of the British West Indies;* and the French islands of St. Pierre and Miquelon, immediately south of Newfoundland, have their *Florule des îles Saint Pierre et Miquelon* by Bonnet and the *Flora Miquelonensis* by Delamare, Renauld & Cardot; Newfoundland has been left to shift for herself.

It is true that several collections have been made upon the island — by Sir Joseph Banks [2] and by John Fraser in the second half of the 18th century; by Bachelot de la Pylaie, Cormack, Miss Brenton and

[1] Read at the meeting of the New England Botanical Club, March 3, 1911.

[2] See James Britten, Journ. Bot. xlii. 84 (1904).

others early in the 19th century; by Dr. John Bell, Dr. Robert Bell, Henry Reeks, Professor Roland Thaxter, J. D. Sornborger, and numerous others [1]; but upon some of these collections no publications have been based, while others have been the bases for comparatively brief lists. La Pylaie undertook the preparation of an elaborate *Flore de Terre-Neuve et des Iles Saint-Pierre et Miclon* with illustrations drawn from living plants, but only our section, devoted to *Algae*, was issued.[2] In 1825, however, he published a little book, *Voyage à l'ile de Terre-Neuve*, giving a journal of his explorations and many notes on the vascular plants and their distribution, publishing several new but undefined names, and recording numerous species of more than usual interest: *Schizaea pusilla* (*S. filifolia* La Pylaie) "dans certaines parties de ces bas-fonds. . . .qu'on nomme *Swamps* dans l'Amérique septentrionale"; *Salix reticulata* on the barrens by Ingornachoix Bay; "*l'Alchemilla officinalis*, dans le partie inférieure des coteaux" of Quirpon Island; and many others which may be discussed at another time. William E. Cormack published an account of his journey made in 1822 across the island from Trinity Bay to Bay St. George and made notes upon some of the plants seen. His account, reprinted in 1873,[3] is rare even in its reprinted form and the plants enumerated, often under unintelligible names, are chiefly the commoner species. Reeks published a somewhat pretentious list of the vascular plants [4] based upon his observations on the west coast, and proposed three new species which were overlooked by the editors of *Index Kewensis* — a *Viola* of the *blanda* group, a *Euphrasia* which was collected in quantity last summer at the type locality and which is uncomfortably near our New England *E. Randii*, and an *Iris* which is clearly *I. setosa*, var. *canadensis*. Reeks's collections, so far as known, were not preserved and his list contains many entries extremely doubtful until the past summer and others which are obvious errors of determination. Dr. John Bell published a very readable account [5] of his trip made in June and July, 1867, and noted some of the commonest plants, with a few which are certainly rare or

[1] For further notes see Robinson & Schrenk, Can. Rec. Sci. vii. 4, 5 (1896).

[2] Paris, 1829.

[3] W. E. Cormack: Narrative of a Journey across the Island of Newfoundland. Reprinted by Moses Harvey (St. John's, 1873).

[4] Henry Reeks: A List of the Flowering Plants & Ferns of Newfoundland with Metereological Observations (Newbury, England, 1873).

[5] John Bell: The Plants of the West Coast of Newfoundland. Can. Nat. ser. 2. iv. 256–263 (1869); v. 54–61 (1870).

local on the island — *Claytonia caroliniana* from a mountain side south of the Great Cod Roy River; *Dryopteris fragrans* from Cairn Mountain; *Epilobium latifolium* from Flat Bay Brook and Grand Lake — and several which were surely misidentified.[1] Dr. Robert Bell's collections made in southeastern Newfoundland in 1885 were the basis of a list (102 vascular plants) by Professor John Macoun.[2]

The largest collections made upon the island by a resident were those of the late Rev. Arthur C. Waghorne who in his missionary work travelled widely and is now remembered at many of the fishing ports of both Newfoundland and Labrador, where he often dried his pressing papers by the kitchen fires. Mr. Waghorne collected rather extensively and his specimens (poorly prepared and labeled in a crabbed and often illegible hand and determined with varying degrees of accuracy) are found in several of our larger herbaria, but the major part of his collections are now deposited with the Geological Survey of Newfoundland. Toward the end of his life Mr. Waghorne had issued three parts (*Polypetalae* and *Gamopetalae*) of his *Flora of Newfoundland, Labrador and St. Pierre et Miquelon.*[3]

Of a more satisfactory character both as to specimens and determinations are the large collections of the past two decades made by three parties of American botanists. In 1894 Drs. Benjamin L. Robinson and Hermann von Schrenk spent the summer collecting in the Avalon Peninsula, with a short side trip to the lower Exploits River. Upon their extensive collections they based a 29 page report published in 1896.[4] In 1901 the New York Botanical Garden sent an expedition to Newfoundland. The members of the party, Messrs. C. D. Howe and W. F. Lang, were algologists but they supplemented their collections of Algae by a large series of vascular plants. So far as I am

[1] Dr. Bell's *Vallisneria spiralis* which the waves "rolled in quantities" on the beach of Bay St. George was certainly *Zostera marina*, his *Viburnum Lentago* must have been the common *V. cassinoides* which he does not mention, his *Cirsium pumilum* from "The Gravels" was undoubtedly a form of *C. muticum* (probably var *monticola* which is common in western Newfoundland), his *Aspidium marginale* from Bay of Islands was unquestionably the there common *A. Filix-mas*; and there is grave doubt of the occurrence in Newfoundland of such plants, mentioned by him, as *Asplenium thelypteroides, Salix petiolaris, Betula lenta, Thalictrum dioicum, Lonicera oblongifolia*, and *Viburnum acerifolium*.

[2] John Macoun: List of Plants collected in Newfoundland in 1885 by Dr. Robert Bell. Geol. Surv. Can., Ann. Rep. n. s., i. 21–25 D D (1886).

[3] Waghorne, Trans. Nova Scotia Inst. Sci., ser. 2. i. 359–375 (1893), ii. 17–34 (1895), ii. 361–401 (1898).

[4] Robinson and von Schrenk: Notes upon the Flora of Newfoundland, Can. Rec. Sci. vii. 3–31 (1896).

informed, no special publication has ever been made upon their collection of flowering plants and ferns. In July and August, 1908, two members of the New England Botanical Club, Drs. Edwin H. Eames and Charles C. Godfrey, spent nearly a month in southwestern Newfoundland, between Port aux Basques and the Bay of Islands, bringing back about 400 species, 50 of them previously unknown from the island. Their results were published in Rhodora [1] for May, 1909.

This, so far as I am aware, summarizes briefly the more important botanical work in Newfoundland up to the past summer. The reasons for this rather meagre record are numerous and, when we look into the history of the colony and realize that until very recently the people of the island have all depended upon the sea, readily understood. But I imagine that with most of us who spend our summers on shore one of the most important reasons for neglecting Newfoundland has been a failure to appreciate how readily accessible is this island of *Terra Nova* which has so long remained to botanists a *Terra Incognita* as well. Few of us realize that Newfoundland is about 350 miles across from east to west and approximately the same from north to south (farther than from Boston to Quebec or about as far as from Boston to Baltimore) and contains 42,200 square miles; i. e. is larger than the island of Cuba or two thirds as large as New England. When this immense area is taken into account it will be readily admitted that, in spite of the notes already published, the flora of Newfoundland as a whole has been among the least known of any flora in civilized America.

And so, in the hope of learning something more of the region and of comparing the flora with that of the mainland and Anticosti Island on the western side of the Gulf of St. Lawrence, the expedition of 1910 was organized. I was fortunate in having as companions Professor Karl M. Wiegand, who had accompanied me on a previous summer's campaign, Mr. Joseph Kittredge, Jr., one of my students, who went as general assistant but soon proved so efficient that he was doing original exploring, and Mr. Alfred V. Kidder, an archaeologist and ethnologist, who represented the Peabody Museum of Harvard University.

Our first sight of Newfoundland was the conventional one, but none the less thrilling and picturesque. Upon rising early on the morning

[1] E. H. Eames: Notes upon the Flora of Newfoundland, Rhodora, xi. 85–99 (1909).

of July 3d as the "Bruce" (now lying at the bottom of Cabot Strait) approached Port aux Basques we gazed with delight upon the great granitic tablelands, their summits and slopes so covered with snow and ice that it was difficult to realize that less than two days before we had left New England sweltering in untempered heat and dust. So here, at our first landing on the island, we almost regretted that we had ticketed through to the Bay of Islands (140 miles north of Port aux Basques), for surely no country could be more tempting to a botanist from farther south nor hold out more hope of boreal plants than this first spot to meet our expectant gaze. But the train would not wait for us to climb the mountains so, making mental note that we must return to explore the region of Port aux Basques and the Cape Ray Mountains, we entered the dining car and had breakfast while the train was surging along winding valleys and around hills or making its way across the less treacherous parts of extensive moors and bogs. By the time breakfast was over and we settled down to uninterrupted observation of the landscape we had passed under more snow-covered tablelands and were following the western flank of the Long Range through the Carboniferous sandstones north of Cape Ray. The region was in places heavily forested, but with occasional extensive bogs which increased in abundance and area as we approached the coast. From the train they seemed exactly like our New England sphagnum bogs, except that there *Arethusa* grew in close colonies forming brilliant spots, as if pots of fifty or more finely flowered plants were set here and there upon the barren; the wet places were often densely carpeted with the little dwarf birch, *Betula nana* L., var. *Michauxii* (Spach) Regel;[1] and there were great carpets bright copper-colored with a cotton-grass which I recognized as my own *Eriophorum callitrix*, var. *erubescens*, a beautiful plant which was thus far known only from Newfoundland and which I had seen only in the herbarium. Such bogs, covered with the *Eriophorum* and the *Betula*, soon began the tantalizing habit, as it seemed to us, of appearing whenever the train whistled for a station but just as regularly disappearing before the station was actually reached. We kept up a continuous "hide and seek" with the *Eriophorum* and the *Betula* for some hours but were unable to catch them near a railway station,

[1] In this paper the authors of species and varieties are given only for such plants as are not included in Gray's Manual, ed. 7.

so we finally solaced ourselves with the thought that they were so abundant that we should find them about the Bay of Islands. But, after we had followed this type of country for seventy-five miles so that we were beginning to think of it as typical Newfoundland, there was a sudden change. The broad open bogs or barrens with scattered Black Spruce and Larch and with the *Eriophorum* and *Betula*, *Arethusa*, *Sarracenia*, *Rubus Chamaemorus*, and *Andromeda*, abruptly gave way to a beautiful dense forest of White Spruce with open park-like glades and springy meadows, with now and then a white mass which we recognized as *Salix candida*, or a clump of pink and white Showy Ladies' Slipper (*Cypripedium hirsutum*). Upon comparing the time-table and Howley's geological map, which quickly became our "guide, philospher and friend" for the summer, it was obvious — just as if the abrupt change in vegetation were not in itself sufficient evidence — that we had left the Carboniferous sandstone area and had entered the Silurian limestones which extend from here to the Bay of Islands and far beyond. Soon after passing St. George's Pond we caught fleeting and thrilling glimpses over the forested valleys of treeless reddish-brown slopes in the West, just like Mt. Albert as one sees it from the East, and we knew, as already indicated by Murray's geological reports and Howley's map, that we should soon be exploring serpentine mountains like those of Gaspé.

After leaving the head of Bay St. George we had seen no towns — only camps and occasional log-cabins — but suddenly emerging from among the Silurian hills we came unannounced upon the Bay of Islands with its prosperous and picturesque town, Birchy Cove. Our headquarters were to be at Petrie's which proved to be a comfortable house on a point reached ordinarily by walking a mile back on the track, but on such occasions as this — a first arrival — by motor boat. Here we found a comfortable home for the summer, with a kind host and hostess and interesting and friendly people at table, and we soon had a work-room equipped and in active use. We had entrusted, a week before we ourselves started, our drying paper, collecting boxes, waterproof clothes, tramping shoes and such other articles as we most needed to the mercies of our old acquaintance, the American Express Company, and this time some brilliant wag had shipped them from Cambridge to Newfoundland by way of Montreal! So during a four days' wait we attempted to explore in our travelling shoes, a programme which on the first day wrought havoc with them, for in

western Newfoundland, and apparently elsewhere on the island, as soon as one leaves the beaten path he is either in a saturated bog or on hard and ragged ridges. Our first few days were consequently occupied in gaining a general knowledge of the region and in picking out spots for more thorough exploration. Immediately around Birchy Cove the woods have been terribly destroyed by forest fire, exposing baked ledges over thousands of acres, and of course in such soilless spots the botanizing was practically spoiled. Similarly, along the roadsides the sheep had browsed so closely that there was little hope there, but we soon discovered unspoiled slopes and mossy woodland glades which exhibited a flora suggesting that of Aroostook County, Maine, or Bonaventure and Gaspé Counties, Quebec, with the abundance of *Selaginella selaginoides*, *Habenaria dilatata* and *hyperborea*, *Cypripedium hirsutum*, *Carex gynocrates*, *vaginata*, and *castanea*, *Tofieldia glutinosa*, *Geum macrophyllum*, *Osmorhiza obtusa*, *Pinguicula vulgaris*, and *Galium labradoricum*; but for some reason, after all, these rich mossy woods of the Silurian hills were quite unlike those of the Silurian region of northern Maine and adjacent Canada, and after many excursions we found out why. There is no Arbor Vitae (*Thuja occidentalis*) in Newfoundland and consequently there are no Arbor Vitae swamps such as we find so generally in our northern calcareous regions; and as the summer passed we were more and more impressed with this singular desideratum, for the absence of Arbor Vitae seems to deprive the island of many of the plants we find so abundantly in its shade: in Newfoundland we watched in vain for *Equisetum pratense*, *Orchis rotundifolia*, *Calypso bulbosa*, *Corallorhiza striata*, *Pyrola asarifolia*, *Lonicera involucrata*, *Valeriana uliginosa*, and *Senecio discoideus*, which on the Gaspé Peninsula are so generally found in the humus of the Arbor Vitae swamps.

But we were not looking simply for familiar plants; and, although the absence of many which we confidently expected was a surprise and opened our eyes and minds to a problem not previously considered, there were plenty of good things to be collected. Many springy places and brook-beds were filled with a dense tangle of a sprawling plant with white clammy pubescence and brilliant yellow flowers, *Mimulus moschatus*, much commoner in the Rocky Mountain region than in the East. The thickets and open woods had tall clumps of a *Scrophularia* strange to us of New England — true *S. nodosa* L., apparently identical with the plant of Europe. In the woods also

were great clumps of *Dryopteris Filix-mas* and *Polystichum Braunii*, with here and there *P. Lonchitis* on the shaded limestone shingle. *Vaccinium ovalifolium*, abundant from Alaska to California and also on the Shickshock Mts. of Gaspé, was common on the hill-tops, as was *Galium kamtschaticum* in cold ravines; and typical *Valeriana sylvatica* Banks (smaller in all parts than our *V. uliginosa*) was occasionally found. Singularly enough each bog and wet woodland glade seemed to have its own specialty: in one *Bartonia iodandra*, a species known only in Newfoundland and Cape Breton; in another *Utricularia clandestina*, heretofore unknown east of New Brunswick; in another a perplexing *Euphrasia*, *Rhinanthus*, or *Senecio*. Along the railway were strange weeds, the most interesting of them perhaps being the Fairy Flax, *Linum catharticum*, with white flowers and opposite leaves, both unusual characters in the genus, and the handsome thistle, *Cirsium palustre*, which was afterward seen at points more than fifty miles apart.

Upon the arrival of our driers, presses and old clothes, it was decided that Kidder and I should undertake a trip across the Island by way of the East Branch of the Humber River and Indian Brook to Notre Dame Bay. We went by train to a point east of Howley whence we could easily reach the Humber system at the Goose Ponds. This region was in the midst of a Carboniferous sandstone area, and I was delighted to find myself actually camping on a sandy and boggy barren such as we had so long watched from the train between Cape Ray and the head of Bay St. George. Here was the flora we had seen from the train, but quite unlike that of the calcareous Silurian region about the head of the Bay of Islands. Except for the nearly endemic *Eriophorum callitrix*, var. *erubescens* Fernald and *Betula nana* L., var. *Michauxii* (Spach) Regel and the everywhere abundant *Calamagrostis Pickeringii*, we might have been on the barren coast of eastern New England, and the chief botanical excitement came from adding to the list of Newfoundland plants such treasures as *Dryopteris cristata*, *Lycopodium clavatum*, var. *megastachyon* Fernald & Bissell,[1] *L. complanatum*, *Scheuchzeria palustris*, *Panicum implicatum*, *Carex trisperma*, var. *Billingsii*, *C. polygama* and *limosa*, *Listera auriculata*, *Salix lucida*, var. *intonsa* and *S. pedicellaris*, var. *hypoglauca* Fernald [2]; while I tried to rouse enthusiasm over *Pinus resinosa*,

[1] Rhodora, xii. 53 (1910). [2] Rhodora, xi. 161 (1909).

Carex debilis, var. *Rudgei*, *C. intumescens*, *Eriocaulon septangulare*, *Salix humilis*, *Populus tremuloides*, *Pyrus arbutifolia*, var. *atropurpurea*, *Ilex verticillata*, *Vaccinium macrocarpon*, *Melampyrum lineare* and *Diervilla Lonicera*. This long list is given, obviously not to display any botanical richness of the region, but because in our whole summer's experience most of these common plants of sterile coastal New England were nowhere encountered except in the sandstone areas of central Newfoundland and of Bay St. George or occasionally on the most sterile summits of hills and mountains. About Sandy Lake are dunes and sandy beaches covered with *Elymus arenarius* and *Juniperus horizontalis*, quite like a silicious coastal strip of eastern New England, but here in the very heart of Newfoundland.

We climbed one of the higher granite mountains of the interior, Mt. Steepmore (or Seemore) but it had little to add to what was on the lower barrens, except *Festuca ovina*, var. *brevifolia*, *Carex scirpoidea* and *deflexa*, *Juncus trifidus*, *Empetrum nigrum*, var. *purpureum* (with small coral-red berries), *Loiseleuria procumbens*, *Arctostaphylos alpina* and *Diapensia lapponica*. In one of the Birchy Ponds at its base was the most beautiful pondweed imaginable, *Potamogeton praelongus*, forma *elegans* Tiselius, a form described from Scandinavia, with delicate translucent leaves almost a foot (3 dm.) long.

A combination of mishaps, head winds, and ineffective guide forced us to turn back before reaching the eastern coast and, after waiting half the night in a peat-bog for the freight train due at 3 o'clock in the afternoon and which we stopped by waving a fire-brand, we reached headquarters in time to see Wiegand and Kittredge starting in the early morning for a three days' trip to the Marble Mountain region of the Humber River. They returned in due time heavily laden with a good collection of calciphiles, among them *Polystichum Lonchitis*, *Carex eburnea*, *Tofieldia palustris*, *Microstylis monophyllos*, *Salix vestita* Pursh, *Arenaria verna*, var. *propinqua*, *A. litorea*, a species probably long ago found in Newfoundland and reported by Pursh as *A. juniperina* (see RHODORA, viii. 34), *Thalictrum alpinum* L., *Anemone parviflora*, *Draba arabisans*, *Saxifraga Aizoon*, *aizoides*, and *oppositifolia*, an *Alchemilla*, *Erigeron hyssopifolius*, and *Taraxacum ceratophorum* (Ledeb.) DC., mostly species which had been recorded by la Pylaie and which we afterward found to be common enough on all the exposed limestones of the West Coast, but certainly a refreshing contrast to the commonplace collection which had come back from the sandy barrens and bogs of Goose Pond and Sandy Lake.

The next move was a double one, Wiegand and Kidder taking the "Home" north to Cow Head in the Silurian limestones north of St. Paul's Bay, Kittredge and I making a first attack upon the serpentine barren which, five miles west of Birchy Cove, forms the northeastern flank of the Blomidon (with some propriety corrupted to "Blow-me-down") Range. We went with keen anticipations, for this serpentine barren from the distance looked so like a reduced Mt. Albert that we felt it inevitable that it should yield the plants which in Gaspé distinguish the serpentine from all the other mountains. And we were in no way disappointed. Here was Mt. Albert all over again; and during the whole summer we did not have a closer day's work than on that single day in late July when, starting soon after sunrise, we tramped in to the mountain from Benoit's Cove in a heavy thunder storm which rendered more obscure an overgrown trail, climbed up to the tableland (plate 87, fig. 3) botanizing all the way, came down over a snow-field at the risk of our lives as it proved, thus teaching us a valuable lesson in mountaineering, and returned before dark five miles through the woods to Benoit's Cove. Our boxes and rück-sacks were crowded full and Mr. Albert,[1] the great serpentine tableland of Gaspé, will be suggested in the plants we had found: *Adiantum pedatum* L., var. *aleuticum* Rupr., first recognized in eastern America on Mt. Albert, occurring in the Selkirks, according to Professor F. K. Butters, only on a serpentine ridge, and similarly, according to Professor John Macoun, found on Vancouver Island only on the serpentine or other magnesian rocks; *Danthonia intermedia* Vasey, unknown elsewhere in the East except on Mt. Albert; *Festuca scabrella* Torr., recently confused with *F. altaica* Trin. and heretofore known in eastern America only on Mt. Albert where it abounds; *Lychnis alpina* L., otherwise unknown south of Labrador except on Mt. Albert and along Coal or Serpentine River in Newfoundland, which takes its name from the serpentine rocks of the Blomidon Range and the Lewis Hills; *Arenaria arctica* Stev. (ditto); *Arenaria ciliata* L., var. *humifusa* Hornem. (ditto), a plant identical with *A. norvegica* Gunn. which in the British Isles has but two stations, one in the Orkneys (soil not stated), the other on a serpentine hill on one of the Shetland Islands[2]; *Statice sibirica* (Turcz.) Ledeb. (Mt. Albert)

[1] See Rhodora, ix. 155, 158, etc. (1907).

[2] See Edmundston, Flora of Shetland, xv (1845); also Syme, English Bot. ii. 104 (1873), where it is stated (105) that *A. ciliata* (true) occurs on calcareous cliffs.

3. Northeastern Tablelands of the Blomidon Range, looking across the Gorge of Blomidon Brook from the treeless Serpentine to the wooded Diorite area.

4. Dry limestone Barren, western edge of Table Mountain, Port à Port Bay.

and *Solidago multiradiata* Ait., the common Arctic American representative of the *Virgaurea* group.

We were still putting our exciting collections into press when the "Home" returned from the North bringing Wiegand with his Cow Head material — practically all the calciphiles of the Humber River marbles and some not met before: *Botrychium Lunaria*, a species which abounds locally in calcareous gravels and beaches or on damp turfy slopes around much of the Gulf of St. Lawrence, often attaining splendid proportions (2–2.5 dm. high, with the sterile lamina 6–7 cm. long); *Poa alpina* and *P. eminens*, two of the handsomest of the genus; *Salix Pseudo-myrsinites* Anderss., a frequent species in the Canadian Rockies and on the Gaspé limestones; one of the puzzling Scurvy Grasses (*Cochlearia anglica* L.); *Draba incana* L. and its var. *confusa* (Ehrh.) Poir. which are familiar to those who have been at Percé in eastern Quebec; *Arabis alpina* L.; *Saxifraga caespitosa* L.; *Parnassia parviflora; Oxytropis campestris* DC., var. *caerulea* Koch, a singularly misnamed plant since its flowers are crimson or "rose-purple" and, like those of many other *Leguminosae*, become blue only when dry; and *Hedysarum alpinum* L., a larger-flowered plant than our variety [1] of Gaspé, the St. John River, and Willoughby, which, as maintained more than a century ago by Michaux and more recently by Fedtschenko [2] and by Ostenfeld,[3] certainly cannot be separated specifically from the Siberian *H. alpinum*. But the plant which upon first discovery was most interesting was a beautiful blue gentian, new to us as well as to the Gray Herbarium, *Gentiana nesophila* Holm, a species heretofore supposed to grow only on Anticosti, but after our first introduction found to be a common plant on the limestones of western Newfoundland as far north and south as we explored — Pointe Riche at the north, Port à Port at the south. In fact this gentian, which abounds on the limy gravels and in damp spots about Ingornachoix Bay and the foot of Bay St. John, was undoubtedly seen by la Pylaie who in that region found "une gentiane voisine du *pneumonanthe*."

Now came the longest flight, the whole party like the Newfoundland fishermen migrating to the Labrador — not very far into Labrador, but north of the Straits of Belle Isle and east of the Canadian bound-

[1] *Hedysarum alpinum*: *americanum* Michx. Fl. ii. 74 (1803). *H. boreale* Nutt. Gen. ii. 110 (1818). *H. americanum* Britton, Mem. Torr. Bot. Cl. v. 201 (1894).

[2] Fedtschenko: Generis Hedysari revisio. Act. Hort. Petrop. xix. 253–258 (1901).

[3] Ostenfeld: Vascular Plants collected in Arctic North America by the Gjöa Expedition. Vidensk. Selsk. Skrift. I Klasse. No. viii. 55, 56 (1909).

ary. In earlier days the name Labrador was used in a general way for the entire peninsula north of the lower St. Lawrence and the Gulf, but in 1876 the jurisdiction of the Government of Newfoundland was defined as that portion of the Labrador Peninsula lying east of a line drawn directly north from Blanc Sablon to 52° N. latitude, thence along the height of land to a point on the mainland-shore nearly south of Port Burwell, Cape Chudleigh. West of this boundary the region is Canadian, the southern tract being Saguenay County, Quebec, the northern Ungava. Many of the older collections made on the Labrador Peninsula prior to this delimitation, and a few more recent ones, from west of Blanc Sablon River are designated as coming from "Labrador" and upon such specimens many so-called Labrador records have been made and new species based — for example, *Calamagrostris labradorica* Kearney, the type from Bonne Espérance, Saguenay County, Quebec, and *Galium labradoricum*, deriving its name from an old specimen presumably from the North Shore of the River or Gulf of St. Lawrence. If we wish our geographic citations to be as generally intelligible as possible it seems wisest to refer to the regions in the Canadian portion of the Peninsula by the most definite designations available (Saguenay County, etc.) and to reserve the name Labrador in its restricted sense (as opposed to the more general Labrador Peninsula), as is done in most if not all up-to-date atlases, for the outer coastal strip of the Peninsula.[1] In these

[1] I have been criticized by at least one student of Natural History for accepting the political boundary and restricting the use of the term Labrador to the Newfoundland dependency, labeling specimens from west of the Blanc Sablon River as from Saguenay County, Quebec. In so doing, however, I simply aim at clearness of record. No one whose daily work brings him the constant annoyance of trying to settle beyond doubt whether many old specimens, often the type-specimens themselves, labeled "Oregon," "Missouri," or "Northwest Territory," really come from Washington, Oregon, Idaho, or western Montana; eastern Montana, Wyoming, Colorado, or some region between the Rocky Mountain states and the Mississippi River; or, in case of Northwest Territory, from one of the Canadian provinces of Manitoba, Assiniboia, Saskatchewan, etc., or even one of our Great Lake states — no one whose daily work is interrupted by the necessity of tracing out the sources of old and obscurely labeled specimens can fail to grasp at every restricted use of a geographic name which makes for simplicity and clearness in citation. In fact, for those who wish to cite exact localities it would be a great advantage if the Labrador Peninsula were subdivided into many more clearly defined districts, for the divisions, Newfoundland Labrador, Ungava, and Saguenay County, Quebec, are all too large for the ready localization of a given point. Thus if we have a plant or other specimen from "Esquimaux Island, Labrador" we are entirely in doubt, unless there is a record of the collector's travels (which most busy people should not be required to look up) whether the specimen came from one of the Mingan Islands (north of Anticosti) in Saguenay County, Quebec, from the famous island at the mouth of Esquimaux River, near the Straits of Belle Isle (also in Saguenay County), from the island in Hamilton Inlet, or from one of the other islands along the coast of the Atlantic, Ungava Bay, or Hudson Bay which were formerly the rendezvous of this now almost extinct race.

notes the official boundary is recognized as it is in the most pretentious publication yet available upon the flora, Delabarre's Report on Botany in his *Report of the Brown-Harvard Expedition to Nachvak, Labrador*.[1]

In the latter work, which in 1902 enumerated all the plants seen on the coast of "Labrador proper" during the summer of 1900 by Professor Delabarre, nearly 200 vascular plants were listed. The work which may yet be accomplished by trained and discriminating explorers is shown by the fact that in Wiegand and Kittredge's one day at Forteau and my five botanizing days at Blanc Sablon, where I once more had the genial companionship of Kidder (principally absorbed in gathering Esquimaux arrow-heads), 331 species of flowering plants and ferns were collected, and of these more than 200 are not in Delabarre's list.

As just intimated, Wiegand and Kittredge went to Forteau, Kidder and I to Blanc Sablon. This division of the party was made in order to compare these two regions having similar geological and geographical conditions, which will become clear by a brief description of Blanc Sablon and the neighboring coast. West of the Straits of Belle Isle the entire north shore of the Gulf and the lower River St. Lawrence is composed of Laurentian gneiss and allied rocks, except at the Mingan region, which is limestone. But the words of Sir William Logan describe the general conditions with authority: "Between this exposure [the Mingan Islands] and Bradore Bay, the distance is about 300 miles. The shore, which is very much indented by bays and inlets, and fringed with a multitude of islands, presents an almost continuous line of bare rock; but in no part of it have there been observed any strata, but such as belong to the Laurentian series. On the east side of Bradore Bay, which is situated near to the entrance to the Straits of Belle Isle from the Gulf of St. Lawrence, the palaeozoic rocks again present themselves. Resting on the Laurentian gneiss, they run along the north coast for nearly eighty miles, with a breadth of probably ten or twelve miles."[2] At Blanc Sablon (plate 86, fig. 1) the flat country through which the river runs is a floor of Laurentian gneiss, in many places converted to shifting sand. Each side of the river the Cambrian limestones and calcareous sandstones rise as five terraces until at an altitude of about 350 feet (115 m.) they reach the tableland which stretches west or east and north

[1] Delabarre, Bull. Geogr. Soc. Phila. iii. 167–201 (1902).
[2] Logan, Canadian Geology, 287 (1863).

until cut through by other streams. Here was an ideal place to study the vegetation of a highly calcareous region side by side with the plants of a silicious and gneissoid area, and if anyone doubts the dissimilarities of these floras he can find no better spot in which to undeceive himself than at Blanc Sablon. And if he is received with the hospitality and desire to make his stop successful which were extended to us by our wide-awake host, Mr. Edwin G. Grant, manager of the cod-fishing "room," and his son and daughter in their large and comfortable summer residence — more than a hundred years old, but with electric push-buttons, typewriter and other signs of contact with the world not looked for on the Labrador as ordinarily described; or if he is entertained as we were by Mr. Grant's friendly rival and neighbor, Mr. Thomas Morel, manager of the fishery on the Canadian side, and his good wife, with pictures and accounts of their home in Jersey, with music and discussions of European galleries and theatres, and with lettuce salad dressed with real Jersey cream and a sight of their garden with a patch of carefully sheltered cucumbers coming on; he will feel that the open-handed hospitality which we read of in early accounts of the Hudson Bay Company is equally dispensed by the Labrador fisherman.

The botanizing at Blanc Sablon furnished such an embarrassment of riches that it is now possible to mention only a few characteristic plants. As representative a day as any was Saturday, August 6, the last field-day I had there. Starting from the settlement on the Labrador side, where the shore is bordered by a broad strand-terrace of gneissoid gravel and sand covered by a broad belt of Strand Wheat (*Elymus arenarius*), with *Catabrosa aquatica*, *Montia lamprosperma* Cham.,[1] *Stellaria crassifolia*, and *Ranunculus hyperboreus* Rottb., a little creeping buttercup with only 3 lemon-yellow petals, in the damp hollows, I made my way through the group of Esquimaux dogs, which all summer hang about the fishery, across the sandy and rocky plain which extends from the river to the terrace-slope. As I remember writing home, the *commonest flower* of these Laurentian plains is *Carex rariflora*, though with singular regard for its specific name it is by all means the rarest of its genus in New England. In some places on the drier part of the plain the turf was composed of *Carex stylosa* C. A. Meyer, an Alaskan species which, like many other Alaskan plants, reappears along the Straits of Belle Isle. In the

[1] See Fernald & Wiegand, Rhodora, xii. 138 (1910).

sand-blows were *Luzula spicata* and a viviparous form of *Festuca ovina* L., var. *supina* (Schur.) Hack., subvar. *pubiflora* Hack., and here were the common plants of the granitic barrens of Newfoundland, Gaspé, or northern New England: the Whortleberry (*Vaccinium uliginosum*) the Bearberry (*Arctostaphylos alpina*), the Curlew-berry (*Empetrum nigrum*) both the typical black-fruited plant and the var. *purpureum* with bright coral-red berries, Baked Apple (*Rubus Chamaemorus*), Dewberry or Plumboy (*Rubus arcticus*), Partridge-berry or Red Berry (*Vaccinium Vitis-Idaea*, var. *minus*) and *Loiseleuria*, *Diapensia*, *Betula glandulosa*, *Salix Uva-ursi*, etc. The bogs were everywhere brilliant with Cotton Grasses, *Eriophorum angustifolium*, *gracile*, *tenellum* and *callitrix*, but handsomest of all the splendid bronze-topped *E. Chamissonis*, and, its known range now extended across from Newfoundland, the recently described *E. callitrix*, var. *crubescens* Fernald. Coming now to the head of a cove the trail passed back of the Strand Wheat, with here and there a colony of the crimson *Rumex occidentalis* or of some perplexing *Epilobium*, clumps of the handsome sunflower-like *Senecio Pseudo-Arnica*, the splendid whitish-green grass, *Poa eminens*, and the bronze-purple *Calamagrostis lapponica* (Wahlenb.) Hartm., like *C. neglecta* with very long spikelets, and soon reached the foot of the limy terraces.

Immediately the vegatation changed. The brooks tumbling and interlacing every few rods along the slopes from the summit-tableland were bordered by a luxuriant thicket of coarse herbs and low shrubs which, in early August, made as rich an alpestrine meadow as one could well imagine. Here was a tangle as high as one's head, with *Salix candida*, *S. vestita* Pursh, *S. Pseudo-myrsinites* Anderss., and several variations of *S. cordifolia* Pursh, strange Goldenrods and Asters, *Angelica atropurpurea*, *Heracleum lanatum*, and a strange villous *Urtica* composing the taller thicket. In making my way up the course of one of these brooks to the crest I encountered more than 175 species of vascular plants, surely a good number for one day's collecting on a Labrador meadow and one difficult to match in our more amiable climates. The brook-margins and moss-bordered rills were everywhere brilliant with Marsh Marigold (*Caltha palustris*) still in bloom, with white masses of *Arabis alpina* L., looking almost exactly like our garden species, the Old World *A. albida*, golden spires of the boreal Yellow Rocket (*Barbarea orthoceras* Ledeb.[1]) and blue

[1] See Rhodora, xi. 140 (1909).

carpets of the northern Speedwell (*Veronica humifusa*), while a beautiful gray-green Ladies' Mantle (*Alchemilla* sp.) made a misty fringe at the edge of the tumbling waters. Occasionally in the wet moss there was a delicate carpet of *Cystopteris montana* (Lam.) Bernh., suggesting a compromise between a broad-fronded *C. bulbifera* and a stockily developed *Phegopteris Dryopteris*; or a colony of *Pinguicula vulgaris* with rich voilet flowers, ordinarily mingled with various Saxifrages and Drabas or the little white *Parnassia Kotzebuei* C. & S. (of southern Labrador, the Gaspé Peninsula, and the Alaskan area). On the exposed rocks at the crests of the terraces were great colonies of Cerastiums, differing from any we had got in Newfoundland and adding two more to the plants we had already collected which, by matching in the herbarium, we are forced for the time being to call vaguely "*Cerastium alpinum*." Occasionally in more open springy spots there were strange sedges and rushes: the chestnut-colored *Kobresia caricina* Willd., its range in eastern America now extended south from Greenland, or *Juncus triglumis* L., an extremely neat little species suggesting *J. stygius*. Near the top of the upper terrace was a meadow crimson and orange-scarlet with *Senecio pauciflorus* Pursh which has discoid heads, the involucre crimson-tinged, the corolla-lobes orange-red, and the anthers yellow.

I had hardly reached the crest at supper time and before turning back could have only the sad satisfaction of seeing for myself that beyond for miles stretched an alluring and to botanists unknown area of alpine meadows, bogs, pools and dry ridges which the approaching night and the call to supper, not to mention the serious difficulty of carrying more plants, forced me to leave until "next time." Returning to the plain, I descended the terrace by a new route, haunted by the consciousness that I was passing by innumerable good things, but stopping only once in the hasty descent to gather a conspicuous lilac-flowered *Erigeron*, the new *E. acris*, var. *oligocephalus*,[1] and again to look over some brackish rocks along shore. Here was a Scurvy Grass (*Cochlearia officinalis* L.) in splendid development, flowering and fruiting plants and new rosettes of thickish round leaves. I was curious to eat some of the plant which for centuries had been credited with great virtues and found it a most palatable salad, in texture crisp and somewhat fleshy, in flavor like horse-radish. Near by

[1] Fernald & Wiegand, Rhodora, xii. 226 (1910)

was an attractive and strange grass which proves to be *Hordeum boreale* Scribner & Smith, a species heretofore known only from Alaska to northern California. But it was growing late and I had so often been tardy at Mr. Grant's table that I hastened back this last day to leave if possible a better impression of my punctuality and appreciation and found a Labradorian meal which would please the most epicurean palate,— a choice of young puffins or young divers, with greens of *Atriplex patula*, var. *hastata*.

Although the boreal plants above enumerated and many others not here mentioned are the species which at first attract the New England botanist visiting the Straits of Belle Isle, they are after all surpassed in geographic interest by a large number of species which one might be tempted to ignore. Mingled with the northern species on the terrace-slopes are the following and many more which to the New Englander make a very tame list: *Phegopteris Dryopteris* and *polypodioides*, *Botrychium virginianum*, *Equisetum scirpoides*, *Milium effusum*, *Cinna latifolia*, *Carex Deweyana*, *vaginata*, *laxiflora*, var. *leptonervia*, and *capillaris*, var. *elongata*, *Clintonia borealis*, *Streptopus amplexifolius*, *Microstylis monophyllos*, *Ranunculus abortivus*, *Actaea rubra*, *Mitella nuda*, *Ribes triste*, *Geum macrophyllum*, *Viola Selkirkii*, *Viola renifolia*, *Conioselinum chinense*, *Chiogenes hispidula*, *Galium triflorum*, *Linnaea borealis*, var. *americana*, *Solidago macrophylla*, and *Petasites palmata*. If one were to enumerate the more typical woodland plants of northern New England and eastern Canada I am quite sure that all of these would be in the list. And it is for just this reason that their occurrence on the terraces and tablelands north of the Straits of Belle Isle is of greatest interest.

In such accounts as I have found (except possibly Cartier's) the coasts of the Straits of Belle Isle are described as desolate and bare, and even Cartier, in 1534, entering the Straits and anchoring at Blanc Sablon, was so impressed with the barrenness that he wrote: "If the land was as good as the harbors there are, it would be an advantage; but it should not be named the New Land [1] but [a land of] [2] stones and rocks frightful and ill shaped, for in all the said north coast I did not see a cart-load of earth, though I landed in many places. Except at Blanc Sablon [3] there is nothing but moss and small stunted woods;

[1] Cartier had just come up the east coast of Newfoundland and apparently took southern Labrador to be part of the same region.

[2] Bracketed phrase inserted by the translator.

[3] At Blanc Sablon the shores and flat country back of the shores are covered with drifting sand.

in short, I deem rather than otherwise, that it is the land that God gave to Cain;" [1] and again on his second voyage, in 1535, he wrote: "The whole of the said coast from the Castles as far as here [2] bears east-northeast and west-southwest, ranged with numerous islands and lands all hacked and stony, without any soil or woods, save in some valleys." [3] And at the present time the people at Blanc Sablon insist that there has never been any forest there and that no timber exists within four or five miles of the Straits. Yet, the first day I saw upon the terraces east of Blanc Sablon such plants as have just been enumerated I was convinced that a forest must have been there, since these are so distinctly woodland species and so decidedly not plants typical of the Arctic barrens and tundra. So my delight can be imagined when, crossing with Kidder the tableland east of Blanc Sablon, we came upon buried logs in the bog and soon after found numerous stumps protruding from the moss. Some of the stumps (plate 86, fig. 2), now much crumbled, were still a foot or more in diameter and indicated an ancient forest of considerable size. Just when this forest lived it is difficult to say, but if it still throve in the 16th century Cartier did not give a very clear indication of it. Only by such indefinite expressions as "except at Blanc Sablon there is nothing but moss and small stunted woods" and "without any soil or woods, save in some valleys" did he indicate a possible forest covering. But here at least was a remnant of the forest which had once sheltered *Carex Deweyana*, *Actaea rubra* and *Viola Selkirkii*, though at the present time only shrubs or dwarf straggling trees, as described by Cartier, thrive on the bleak and wind-swept shores of the Straits of Belle Isle; and that the forest was an extensive one and presumably once fringed the entire length of the Straits we are safe in assuming from the presence at Bonne Espérance, L'Anse au Clair, Forteau, Red Bay, and Chateau (as shown by the collections of John A. Allen and others) of a relict forest vegetation (sometimes further augmented by *Onoclea sensibilis*, *Osmorhiza obtusa*, *Pyrola secunda*, etc.) such as abounds on the terraces of Blanc Sablon.

The "Home" which we had expected back from Battle Harbor Saturday night came Sunday evening and we found ourselves sharing a stateroom with two professors from the Methodist College at

[1] J. P. Baxter, Memoir of Jacques Cartier, 86 (1906).
[2] From Chateau Bay as far as Brest, west of Blanc Sablon.
[3] J. P. Baxter, l. c. 130.

St. John's, who were making a circuit of Newfoundland collecting plants for their newly organized Natural History Society. As loyal British subjects they were trying to identify their plants by means of Bentham's *Handbook of the British Flora;* and I am sure they were able thus to identify nearly half the species they found, for of the known vascular plants of Newfoundland (scarcely 1000 species) more than 400 occur in Scotland, northern England or Ireland, though about 825 of them are found in the "manual region."

At Port Saunders we were joined again by Wiegand and Kittredge who, having met at Forteau with no such comfortable quarters as we enjoyed at Blanc Sablon, had come south a week before and had been having a busy week on the limestone barrens about Ingornachoix Bay and on Pointe Riche. They had some of the best things of Blanc Sablon — *Hordeum boreale* Scribner & Smith, *Kobresia caricina* Willd., *Juncus triglumis* L., etc. — and a most interesting lot besides: *Carex bicolor* All., quite like the smallest European specimens; *Salix reticulata* L., reported years ago from Ingornachoix Bay by la Pylaie and so far as we can make out just like the shrub of northern Europe; other strange willows including a beautifully distinct species allied to the Lapland *S. lanata* L.; *Lesquerella arctica* (Richardson) Watson, var. *Purshii* Watson, a single stunted individual but precious, for the plant had heretofore been known only from Anticosti; *Drosera anglica*, familiar in the marl-bogs of Gaspé; *Potentilla maculata* Pour., now extended south from northern Labrador; *P. nivea* L., an arctic species already familiar to me on calareous cliffs of eastern Quebec, but here with remarkable old thickened caudices; *Dryas integrifolia* Vahl, another arctic type familiar on the Gaspé limestones; *Campanula rotundifolia* L., var. *alaskana* Gray, a gigantic variety previously known only from the Bering Sea region; two new *Antennarias*, one of them a canescent variety of *A. alpina* (L.) R. Br. (var. *cana* Fernald & Wiegand [1]), the other apparently an undescribed species; *Tanacetum huronense* in a dense low and very pubescent form found in dry exposed shingle; and other good things too numerous to mention.

Once back to our presses at Birchy Cove it took us only two days to put up all our specimens and by means of corrugated boards and hot papers [2] to get them ready to leave, so that in three days we were

[1] Rhodora, xiii. 24 (1911).

[2] See J. F. Collins, Rhodora, xii. 221 (1910).

established for a short time at the comfortable and to us quite luxurious "Log Cabin" at Stephenville Crossing at the head of Bay St. George. Kidder after the Labrador trip had returned to Boston for a happy errand — his marriage, and we naturally missed his hearty comradeship and the jingle in his rück-sack of arrow- and spear-heads as they clicked against the bones of ancient Esquimaux, Montagnais, or Beothuks.

The "Log Cabin" at Stephenville Crossing, more elegantly known as St. George's Hotel, is situated at the edge of extensive sand dunes where were *Ammophila arenaria, Carex silicea* and *C. hormathodes*, var. *invisa*, just as if we were on the coast of Cape Cod or Long Island. This region had been so thoroughly worked over by Messrs. Eames and Godfrey that there was little of novelty for us, but we were specially interested to find upon the sands or clays and the bogs just the plants which had been seen on the similar Carboniferous area of central Newfoundland, and a few others which were now beginning to mature: *Lycopodium inundatum, L. complanatum*, var. *flabelliforme, Spartina glabra*, var. *alterniflora, Scirpus subterminalis, Habenaria blephariglottis, Calopogon pulchellus, Hypericum virginicum, Cicuta bulbifera, Gaylussacia dumosa*, var. *Bigeloviana* Fernald,[1] and *G. baccata*, which are all typical species of our sterile New England coast. Around some of the sand-bottomed pools were dense carpets of *Juncus pelocarpus*, identical with the plant of our sandy shores, and, contrasting with it, the creeping or floating *J. subtilis*. All summer we had been forced by the abundance of the attractive but taxonomically most perplexing Eye Brights to collect many different lots of *Euphrasia*. But here were two or three which we had nowhere seen before, so that much of our time was taken in collecting and studying them.

Then on Monday, August 8, we drove out the north shore of Bay St. George to the village of Port à Port. Here the Carboniferous sandstones gave way to Silurian limestones and the locality which first attracted our attention and took practically all the time we had was the southwestern edge of Table Mountain (in Newfoundland almost every community on the west coast has its own "Table Mountain"), a white limestone tableland rising only about 1000 feet (300 meters) above Port à Port Bay. When we reached the crest we were

[1] Rhodora, xiii. 99 (1911).

puzzled to know where to begin, for we had only the one day for exploring this vast area, with bare unforested alpine barrens stretching some miles to the east and farther to the north, while beyond we could see the higher bare-topped tablelands of the Lewis Hills, serpentine, diorite, limestone, and trap, which at their highest points attain an altitude of 2700 feet (800 meters). There was no time to lose, for everywhere about us were most of the species we had first met and had then considered to be rarities on the Marble Mountain, Cow Head, Ingornachoix Bay, or the terraces of Blanc Sablon and Forteau. The western margin of the tableland is mostly dry and shingly (plate 87, fig. 4), but farther back becomes boggy, with small pools and wet runs. On the drier portions of the first low dome of the mountain which we explored the commonest species were *Salix vestita* which is apparently common on all the limestones of western Newfoundland; *Lesquerella arctica*, var. *Purshii*, here in great profusion; *Tofieldia palustris*; a number of strange Euphrasias; *Carex pedata* Wahlenb., a tiny species heretofore unknown south of Greenland and arctic Alaska; *Carex rupestris* All., probably commoner than is supposed, for it abounds on dry limestones of Gaspé as well; *Dryas integrifolia* and a variety with the leaves white-pubescent above (var. *canescens* Simons, previously known only from Ellesmere Land); *Antennaria alpina*, var. *cana*; and the more generally distributed Saxifrages and Arenarias, *Anemone parviflora*, *Thalictrum alpinum*, etc. The wetter part of this dome was quite boggy, and in the humus and moss we found a few of the ordinary bog plants, which did not venture upon the open limestone gravel.

The drier surface of the second dome visited lacked the *Lesquerella*, *Carex pedata*, and several other plants which had abounded on the farther side of a narrow wooded sag, but here was a strange *Antennaria* in great profusion — the remarkable plant subsequently described as *A. eucosma*,[1] and as yet known only from this mountain and Anticosti Island, and here were many other plants we had not seen on the first dome: *Woodsia glabella* in the full glare of the alpine light (I had never before seen it except in humus at the crests of woodland cliffs); *Hedysarum alpinum*, *Oxytropis campestris*, var. *caerulea*, *Potentilla fruticosa*, var. *tenuifolia* Lehm. forming little prostrate mats upon the rock; and other plants as yet not worked out. In a

[1] Fernald & Wiegand, Rhodora, xiii. 23 (1911).

wet boggy run upon this dome, where we flushed a covey of ptarmigan which started one by one almost from under our feet, were *Kobresia carcina*, *Juncus triglumis*, *Equisetum variegatum*, and other species which we had only occasionally met; but the greatest discovery here was a finely fruited *Carex* which we at once recognized as the long-lost *Carex Hornschuchiana* of Newfoundland. In 1794 Goodenough, in describing from Eaton his *C. fulva*, supplemented the description of the English plant with the comment: "I have received it from *America* and *Newfoundland*, but never understood till very lately that it was an inhabitant of our country."[1] Goodenough's Eaton plant subsequently proved to be a hybrid of one of the forms of *C. flava* and the common European *C. Hornschuchiana* Hoppe, so that the name *C. fulva* is correctly applied only to the hybrid, and the identity of the Newfoundland plant mentioned by Goodenough has remained somewhat vague. The plant of Table Mountain (and also of Hugh's Brook, Bay of Islands, where we subsequently found it) is quite like typical *C. Hornschuchiana* except in size of the perigynia and other minor characters[2] and singularly enough was associated with forms of *C. flava* and a hybrid so like the true *C. fulva* of Goodenough as to differ only in the slightly larger perigynia. The rediscovery of this Newfoundland plant was indeed gratifying, but in view of the occurrence on the limestones of western Newfoundland of a few other plants — *Gentiana nesophila*, *Lesquerella arctica*, var. *Purshii* and *Antennaria eucosma* — which are otherwise known only

[1] Good. Trans. Linn. Soc. ii. 178 (1794).

[2] Carex Hornschuchiana Hoppe, var. **laurentiana** Fernald & Wiegand, n. var., a forma typica recedit habitu majore, foliis basilariis 3–4 mm. latis, culmis 3–6 dm. altis, spicis foemineis crassioris, perigyniis 3.5–4.5 mm. longis.

Differing from the typical form of the species in its larger habit; the basal leaves 3–4 mm. broad; the culms 3–6 dm. high (in the European 3–4.5 dm. high); the pistillate spikes thicker; perigynia 3.5–4.5 mm. long (in the European 3 mm. long).— Newfoundland: wet runs and boggy spots in limestone barrens, altitude 200–300 m., Table Mountain, Port à Port Bay, Aug. 16, 1910, *Fernald & Wiegand*, no. 2897 (type-specimen in Gray Herb.); marsh near the mouth of Hugh's Brook, Bay of Islands, September 6, 1910, *Fernald & Wiegand*, no. 2898. Quebec: peat marsh or bog, Ellis Bay, Anticosti, September 7, 1883, *J. Macoun*, no. 32.

It is possible that var. *laurentiana* will prove to be identical with *Carex Greeniana* Dewey, Am. Jour. Sci. xxx. 61 (1836). The latter plant was "found in the neighborhood of Boston, by B. D. Green[e]; described from specimens in Dr. Torrey's herbarium," and by subsequent authors was said to be *C. fulva*. The specimen preserved in B. D. Greene's own herbarium (at the Boston Society of Natural History) is immature and does not show clearly whether or not the plant is typical *C. Hornschuchiana* or var. *laurentiana*. Nothing of the sort has subsequently been found near Boston and there is a possibility, as has more than once been suggested, that the Greene specimens were a casual introduction from Europe.

on the limestone island of Anticosti,[1] it is interesting to find that the same large-fruited American variety of *Carex Hornschuchiana* was collected in 1883 on Anticosti by Professor John Macoun and was listed in his Catalogue as *C. fulva*, "certainly indigenous."

The discovery of this plant would have made a fitting climax for one of the most thrilling days of our summer, but after we had repeatedly made solemn vows to look at nothing else and were finally hastening back across the barren in order to reach the settlement before dark, an unusual appearing *Senecio* came riding down a mass of sliding gravel to my very feet. This was too great a temptation, so I snatched the plant as it was sliding past and Professor Greenman tells me that it is one of a unique group of species supposed to grow only on the highest of the Rocky Mountains. While hurrying in the twilight down the slope to Port à Port we found damp ledges covered with *Phegopteris Robertiana*, a species rare in America, but quickly distinguished in the field from the common *P. Dryopteris* by its narrower firmer fronds and gray-green color. We were very late to supper but Mrs. MacDonald had a tempting rabbit stew and fresh lettuce ready for us; and next morning, after a breakfast of *Lactarius deliciosus* (which we had never before made a *pièce de résistance*), when we washed and sorted our plants we found that we had collected on Table Mountain 184 species in quantities varying from one to twenty sheets — one of our record days for the summer.

On the way back to Birchy Cove Wiegand and I left the train half way up Harry's River and followed the valley all day from there to the Log Cabin at Spruce Brook, on St. George's Pond. The region traversed was one we had watched with interest from the train, for there in the limy alluvium the plants reached a wonderful degree of luxuriance. The goldenrods, all strange to us and still unidentified except *Solidago rugosa*, var. *villosa*, were shoulder high; *Calamagrostis Pickeringii*, one of the commonest grasses of the island and elsewhere rarely 3 dm. high, was here more than 1 meter tall; *Deschampsia caespitosa*, which elsewhere on the island, as in eastern Canada and New England, is commonly 3 to 6 dm. high, here attained a gigantic stature, the first clump which met our gaze as we descended from the train being 1.5 meters (5 feet) high with panicles nearly 5 dm. long; and in walking through the Ostrich Ferns and Cow Pars-

[1] Certain badly crumbled specimens from Labrador seem to be *Lesquerella arctica*, var. *Purshii*, but better material is needed to confirm its occurrence on that coast.

nips on the river flats we felt like mere pygmies with the latter plants stretching high above our heads. Surely if farming is ever to succeed in Newfoundland, where people have lived for three centuries without seriously attempting it, this is the region which should take the lead — a valley with deep limestone alluvium, with a native vegetation similar to that of "the Aroostook, the Garden of Maine," lying in nearly the same latitude and shut in by hills sufficiently high to afford considerable protection from the bleaker winds. Messrs. Dodd and Paulett, the energetic proprietors of the ill-fated Log Cabin at Spruce Brook (burned during the winter of 1909–10, then rebuilt and burned again last summer) have already demonstrated that this soil will yield wonderful crops, and of all the regions seen by us it seemed the one best worth developing. Many plants common to this region and northern Maine were seen, *Cypripedium hirsutum*, *Eupatorium purpureum*, var. *foliosum*, *Cystopteris bulbifera*, *Trisetum melicoides*; and commonest of all *Carices* in the valley, *Carex flava*, var. *gaspensis* Fernald, first found in the Gaspé Peninsula but later in the rich valley of the Meduxnakeag in Aroostook County.[1] On the gravelly beach of St. George's Pond, as well as along Harry's River, the handsome *Epilobium latifolium* L., was abundant, and at several points we saw the Foxglove, *Digitalis purpurea*, which had spread from the wild garden at Spruce Brook and, Mr. Paulett informed us, has now established itself for five miles around, as it did long ago on the northwestern coast of America.

Leaving the new collections with Kittredge to care for Wiegand and I went back to the Blomidon tablelands (plate 87, fig. 3). The first day and a half were devoted to the serpentine area, where we followed up many strange plants which still await critical study. *Juniperus communis*, var. *montana*, common everywhere on the island, was now in fully mature fruit and conspicuous for the large size of the berries. *Drosera linearis* was abundant about some of the shallow pools; and we were suddenly struck with the fact that the only fern on the serpentine besides the everywhere abundant *Adiantum pedatum*, var. *aleuticum* was *Osmunda regalis*, a species we had observed hardly anywhere else on the island, though others have found it in the more sterile sections. But here the plants were anything but regal, 1.5 to 3 dm. high, with the very short oblong pinnules

[1] See Rhodora, xii. 115 (1910).

quite different in their proportions from those of the ordinary plant. A study of the serpentine plant shows it to be *O. regalis*, var. *pimila* described by Milde and taken up by Luerssen as a constant variation known only from Brandenburg and Silesia.

Foot-travel in Newfoundland, except on the beaten trails and open tablelands, is notoriously difficult, and the Blomidon talus-slopes are no exception. At the end of the first day Wiegand had succeeded in bruising one of his feet so that next morning I started, accompanied only by our packer, a particularly foul-smelling "Jacky Tar" as the French of this coast are called, for the diorite tableland which lay a few miles to the west of our camp. It was necessary practically to climb the slope of the intermediate serpentine tableland, then to descend 1500 feet to the bed of Blomidon Brook and up the other side which was diorite. The freshly broken talus was slightly calcareous and had some of the common calciphiles, but the weathered rock from which the soluble lime had leached was carpeted in patches with the plants we are used to on our granitic mountains, and *Phyllodoce caerulea* was here seen for the first time in the entire summer and *Stipa canadensis* was apparently new to the island. Here were no signs of the plants of the serpentine which abounded only a short distance to the east, and much of the tableland was wooded and covered with a dense carpet of moss and humus. Ponds and shallow pools were everywhere and I was glad to find in one of them *Callitriche anceps* Fernald [1] which was discovered in 1906 in ponds on Table-top Mountain, Gaspé, and which we had found also in Blanc Sablon River. *Drosera anglica* was common as were many plants which earlier in the summer had been quite new to us; but the species which interested me most were two which seemed entirely out of place in this subalpine habitat. Among the tufts of *Scirpus caespitosus* which, as on many similar barrens, formed broad carpets in the drier portions of the bogs, was the famous little fern of the New Jersey Pine Barrens, *Schizaea pusilla*, already known in Newfoundland from collections of la Pylaie, Waghorne, and Eames & Godfrey and after we had once seen it found wherever we looked for it; also known at remote stations in Nova Scotia, but quite unknown between there and southern New Jersey. Here at 2000 feet altitude it abounded over many acres, nestling in the bases of the *Scirpus* tussocks; while in many

[1] Rhodora, x. 51 (1908).

of the shallow ponds *Potamogeton Oakesianus*, another New Jersey species and one of the commonest of its genus on Nantucket and Cape Cod, though unknown in eastern Maine, New Brunswick and Nova Scotia, was fruiting profusely.

Long before dark I had followed Wiegand's unfortunate example of the day before and came into camp hobbling on one foot and a heel. He, fortunately, was on both feet again, but when we got back to Birchy Cove and the doctor found that I had cracked the tendon of my little toe I was laid aside for repairs and it was nearly two weeks before I ventured off the piazza. Wiegand and Kittredge meanwhile went on the "Home" to Bonne Bay, by many said to be the most picturesque fiord south of northern Labrador. This trip had been one of my fondest hopes, for the mountains about Bonne Bay are a duplication of those about the Bay of Islands and years ago, when I first read Logan's account of Bonne Bay, I had set my heart on sometime making a comparison of that region and the Bay of Islands area. But, although it was necessary to delegate to others this part of the work, my enforced housing brought the great pleasure of at last making the acquaintance of the paleontologist, Professor Charles Schuchert who, with his companion (making up the "Yale Expedition" of the Newfoundland papers) had been studying all summer much the same region as the "Harvard Expedition," but whom we had always preceded or immediately followed at our various centers of work.

In less than a week Kittredge returned bringing part of the Bonne Bay collections, but the "hoodoo" was still with us. Kittredge was yellow with jaundice and soon returned to Boston and a less strenuous life. Wiegand, after leaving Bonne Bay, had gone north to Blanc Sablon whence he returned without mishap bringing the remainder of the Bonne Bay collections. These, in brief, were an exact duplication of the Blomidon plants, the Bonne Bay serpentines yielding the *Adiantum*, *Osmunda*, *Danthonia*, *Lychnis*, *Arenaria arctica* and *A. ciliata*, var. *humifusa*, *Statice*, and all the others (except perhaps *Festuca scabrella* which it was now too late to collect); Lookout Mountain, the Bonne Bay counterpart of the diorite portion of the Blomidon Range yielding *Schizaea pusilla*, *Potamogeton Oakesianus* and two plants we had not before seen: *Sparganium hyperboreum*, found by Eames and Godfrey on the Blomidon diorite; and *Eleocharis nitida*, a little sedge heretofore known only from the diorite region at the head of the Ottawa River in Canada.

Thus I have recounted some of our discoveries and have as briefly as possible, though I fear at too great length, tried to give some impression of our more notable days of field-work during the past summer. Many unchronicled days yielded important results and after determining all the plants we can by matching in the herbarium and by the ordinary works of reference we have a stack of "snags" in many tight bundles awaiting monographic study. And if I have laid no stress on the abundance of insect pests which Newfoundland shares with Gaspé, Anticosti, Labrador and New Jersey, it is because we soon grew accustomed to our veils and canopies and took them as mere incidents in a thoroughly absorbing summer.

Part II. The Geographic Origin of the Flora of Newfoundland.

There are many comparisons which it would be interesting to make: of the flora of the west coast, for example, with that of the east as shown by the collections of Waghorne, Robinson and Schrenk, Howe and Lang, Sornborger, and others, but we still know too little of the detailed distribution to undertake such generalizations with assurance. Certain facts of wider scope, however, are so obvious as to challenge immediate explanation. As we have seen, the boreal and even the arctic floras are abundantly represented in Newfoundland; and, especially in the sandy areas or in the bogs on the Carboniferous sandstones the plants of southern New England, Long Island, New Jersey, and even of the more southern Coastal Plain are abundant,— such species as *Panicum implicatum*, *Ammophila arenaria* (found also on the sand dunes west of Blanc Sablon), *Scirpus subterminalis*, *Carex silicea*, *C. hormathodes*, *C. sterilis* (*atlantica*), *C. trisperma*, var. *Billingsii*, *Eriocaulon septangulare*, *Juncus pelocarpus*, *Habenaria blephariglottis*, *Spergularia rubra*, *Arenaria peploides*, var. *robusta*,[1] *Pyrus arbutifolia*, var. *atropurpurea*, *Corema Conradii*, *Elatine americana*, *Hudsonia ericoides*, *Myriophyllum tenellum*, *Vaccinium macrocarpon*, *Gaylussacia dumosa*, var. *Bigeloviana*, *Utricularia clandestina*, *Solidago uniligulata*, *Aster radula* and *A. nemoralis;* while there and even on the highest mountain-tablelands *Schizaea pusilla*, *Potamogeton Oakesi-*

[1] See Rhodora, xi. 114 (1909).

anus, and *Rynchospora fusca* of our southern coasts are mingled with arctic-alpine species. These two elements, the arctic-alpine and the southern coastal types are, then, abundant; but when we look for the commonest plants which abound in all the forested area west of Newfoundland, from eastern Quebec, New Brunswick, and Nova Scotia to the Great Lakes, i. e. the typical Canadian species, we find them singularly few in number.

These facts become more vivid when we map the known distribution in eastern America of the species which make up the native flora of Newfoundland. So far as we yet know, the indigenous species and recognized varieties on the island number 783, while there are about 200 species clearly introduced by man. The indigenous plants when traced throughout their known continental ranges fall into four primary classes distinguished from their geographic position (in relation to Newfoundland) as:

Class I. Boreal Types.

Class II. Western or Canadian Types not included in I.

Class III. Southwestern Types.

Class IV. Endemic Plants or Species unknown on the American Continent.

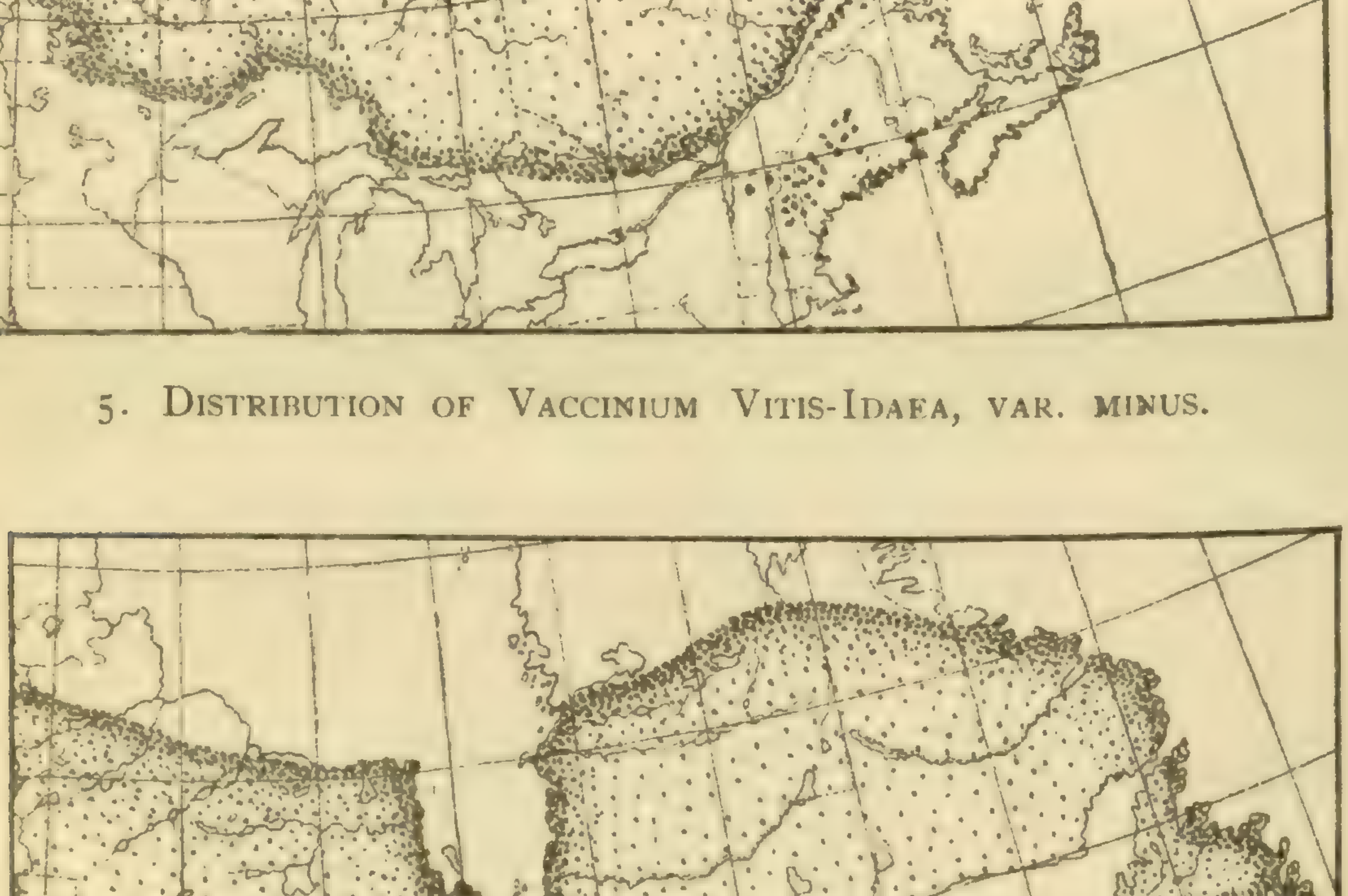
These major floras may be further defined and subdivided as follows:

CLASS I. BOREAL TYPES. Here are included all species which occur to the north of Newfoundland: in Labrador proper, Baffin Land, Ellesmere Land or Greenland or in the arctic-alpine regions farther west. In their detailed distribution these plants fall into four subclasses which together include **466 species = $59\frac{2}{5}$ per cent** of the Newfoundland flora.

SUBCLASS A. ARCTIC-ALPINE SPECIES COMMON TO NEWFOUNDLAND, LABRADOR, AND EASTERN CANADA (the Gaspé Peninsula or the more exposed portions of New Brunswick and Nova Scotia). **216 species = $27\frac{3}{5}$ per cent** of the Newfoundland flora.

This large group includes such familiar plants of our higher Canadian or New England mountains as *Lycopodium Selago, Phleum alpinum, Calamagrostis hyperborea, Poa alpina, Scirpus caespitosus, Carex rariflora, Juncus trifidus, Tofieldia palustris, Salix Uva-ursi, Betula glandulosa, Arenaria arctica, Lychnis alpina, Thalictrum alpinum, Dryas integrifolia, Empetrum nigrum, Rhododendron lapponicum, Phyllodoce caerulea, Arctostaphylos alpina, Diapensia lapponica,* and *Pinguicula vulgaris;* and their range in America is fairly typified by the Mountain Cranberry (*Vaccinium Vitis-Idaea*, var. *minus*) which is common from

5. Distribution of Vaccinium Vitis-Idaea, var. minus.



6. Distribution of Ribes prostratum.

Newfoundland and the North Shore of the St. Lawrence northward, but south of the lower St. Lawrence is restricted to the more exposed mountains, high hills, rock-coasts and cold bogs. The range of this plant in eastern America is shown in plate 88, fig. 5.[1]

SUBCLASS B. ARCTIC-ALPINE SPECIES COMMON TO NEWFOUNDLAND AND LABRADOR (OR GREENLAND) BUT UNKNOWN IN EASTERN CANADA OR NEW ENGLAND. **16 species = 2 per cent** of the Newfoundland flora.

This subclass includes widely distributed polar species all of which are likely to be found on Anticosti or the Gaspé Peninsula: such plants as *Hordeum boreale*, *Kobresia caricina*, *Carex pedata*, *Juncus triglumis*, *Capsella elliptica* C. A. Meyer, *Cochlearia anglica*, *Potentilla maculata*, and *Antennaria alpina*, var. *cana*.

SUBCLASS C. ARCTIC-ALPINE SPECIES KNOWN IN VARIOUS SECTIONS OF NORTHERN CANADA OR ALASKA BUT AS YET UNKNOWN IN LABRADOR PROPER. **16 species = 2 per cent** of the Newfoundland flora.

These are mostly plants confined to the highly magnesian rocks (serpentine, etc.), areas which because of their extreme sterility are rarely visited by those who are looking for plants. The magnesian areas of Labrador, when explored, will doubtless yield these plants: such species and varieties as *Adiantum pedatum*, var. *aleuticum*, *Danthonia intermedia* and *Festuca scabrella*.

SUBCLASS D. HUDSONIAN OR CANADIAN PLANTS COMMON TO NEWFOUNDLAND, SOUTHERN OR FORESTED LABRADOR, AND EASTERN CANADA. **218 species = $27\frac{4}{5}$ per cent** of the Newfoundland flora.

It is naturally difficult to draw a definite line between the Arctic-alpine and the Hudsonian plants on the one hand and the Hudsonian and Canadian on the other, for in such regions as Newfoundland and eastern Canada these groups mingle in the most perplexing fashion. The plants of Subclass D are probably chiefly Hudsonian for they extend across the Labrador Peninsula to the Atlantic coast or the Straits of Belle Isle, but this subclass contains a number of species, already enumerated on p. 125, which are ordinarily of more southern range and belong more properly to the Canadian or even the Alleghanian flora. **The significant point for the present study is the fact that these 218 plants of Subclass D occur north of Newfoundland, in Labrador**. This large group includes, besides the species listed on p. 125, such very familiar species as *Cryptagramma Stelleri*, *Dryopteris Filix-mas*, *Lycopodium complanatum* (true), *Larix laricina*, *Picea canadensis*, *P.*

[1] The maps here reproduced show the broad range of the species but do not attempt to indicate exact stations.

mariana, *Abies balsamea*, *Triglochin palustris*, *Scirpus hudsonianus*, *S. atrocinctus*, *Eriophorum gracile*, *Carex Michauxiana*, *Habenaria hyperborea*, *H. dilatata*, *H. obtusata*, *Spiranthes Romanzoffiana*, *Listera cordata*, *Salix balsamifera*, *S. candida*, *Populus balsamifera*, *Betula pumila*, *Drosera rotundifolia*, *Parnassia parviflora*, *Ribes lacustre*, *R. prostratum*, *R. triste*, *Pyrus sitchensis*, *Amelanchier oligocarpa*, *Geum macrophyllum*, *Epilobium angustifolium*, *Circaea alpina*, *Osmorhiza obtusa*, *Heracleum lanatum*, *Cornus canadensis*, *Pyrola minor*, *Primula farinosa*, var. *macropoda*, *Halenia deflexa*, *Galium labradoricum*, *Viburnum pauciflorum* and *Solidago macrophylla*. A good conception of the broad range of this group is gained from the map (plate 88, fig. 6) showing the distribution in eastern America of the Skunk Currant (*Ribes prostratum*).

CLASS II. WESTERN OR CANADIAN TYPES NOT REACHING LABRADOR. **27 species = 3½ per cent** of the Newfoundland Flora.

These plants occur on the west side of the Gulf of St. Lawrence (in northern Nova Scotia, New Brunswick, the Gaspé Peninsula and adjacent area or on Anticosti) but are unknown in central and southern Nova Scotia, coastal Massachusetts, Long Island and eastern and southern New Jersey. From the following list, which includes all of the species of Class II, it will be seen that many of these plants are such as by further exploration are likely to be discovered in Labrador, when they will take their places in Class I; and that none of them are characteristic (if found at all) in the southern half of Nova Scotia and the coastal region southward.[1] *Potamogeton filiformis*, *Trisetum meliciodes*, *Eleocharis nitida*,[2] *Scirpus pauciflorus*, *Carex eburnea*, *Carex flava*, var. *gaspensis*, *C. Hornschuchiana*, var. *laurentiana*,[3] *Carex castanea*, *Juncus compressus* Jacq., *Juncus alpinus*, var. *insignis*, *Tofieldia glutinosa*, *Zigadenus chloranthus*, *Listera auriculata*, *L. convallarioides*, *Salix glaucophylla*, *S. Barclayi*, *Polygonum Roberti* Loisel.,[4] *Ranunculus Macounii*, *Ribes hirtellum*, var. *saxosum*,[5] *Viola nephrophylla*, *Shepherdia canadensis*, *Pyrola asarifolia*, var. *incarnata*, *Gentiana nesophila*, *Galium kamtschaticum*, *Lobelia Kalmii*, *Antennaria eucosma*,[6] and *Tanacetum huronense*.

CLASS III. SOUTHWESTERN TYPES. This class contains **274 species = 35 per cent** of the Newfoundland flora. It consists of

[1] For notes on *Lesquerella arctica*, var. *Purshii* see p. .

[2] Known as yet only from western Newfoundland and the upper Ottawa River (see p. 134).

[3] There is a possibility that this was once found in eastern Massachusetts (see p. 130).

[4] *Polygonum Roberti* has been collected at the Grand Narrows, Cape Breton (*Macoun*, no. 20,206).

[5] See Rhodora, xiii. 75, 76 (1911).

[6] See Rhodora, xiii. 23 (1911).

7. Distribution of Calopogon pulchellus.

8. Distribution of Pinus resinosa.

plants found chiefly in regions to the southwest of Newfoundland and may be divided into two subclasses.

Subclass A. Canadian and Alleghanian Plants common to Newfoundland, Nova Scotia, New Brunswick, and coastwise New England but unknown in easternmost Quebec or Labrador. **214 species = 27⅓ per cent** of the Newfoundland flora.

It is not possible in our northeastern regions to distinguish sharply between the Canadian and Alleghanian floras. Many plants such as *Onoclea sensibilis*, *Osmunda cinnamomea*, *Pinus Strobus*, *Cypripedium acaule*, *Salix humilis*, *Spiraea latifolia*, *Acer rubrum*, *Aralia hispida*, *Pyrola americana*, *Epigaea repens*, *Lysimachia terrestris*, and *Solidago rugosa* abound in both regions and very often encroach upon the Carolinian area. In placing species in Subclass A no distinction has been made between Canadian and Alleghanian; **but the significant point in regard to this large group is that its species occur in the North Atlantic States, Nova Scotia, and often New Brunswick, are rare or unknown on the Gaspé Peninsula or Anticosti, and reach their northeastern limit on the continent in western Saguenay County, Quebec, 400–500 miles west of the Straits of Belle Isle**.

Besides the species just enumerated this group contains such very familiar plants as *Dryopteris cristata*, *Lycopodium complanatum*, var. *flabelliforme*, *Pinus resinosa*, *Panicum boreale*, *Oryzopsis asperifolia*, *Glyceria canadensis*, *Elymus virginicus*, *Scirpus georgianus*, *Rynchospora fusca*, *Carex vulpinoidea*, *Juncus effusus*, var. *Pylaei*,[1] *J. canadensis*, *Trillium cernuum*, *Calopogon pulchellus*, *Pogonia ophioglossoides*, *Arethusa bulbosa*, *Salix discolor*. *Polygonum sagittatum*, *Pyrus melanocarpa*, *Rosa virginiana*, *Ilex verticillata*, *Oenothera pumila*, *Cicuta bulbifera*, *Gaultheria procumbens*, *Gaylussacia baccata*, *Vaccinium macrocarpon*, *Apocynum androsaemifolium*, *Lycopus uniflorus*, *Viburnum cassinoides*, *Lobelia Dortmanna*, *Eupatorium purpureum*, var. *maculatum*, *Aster nemoralis*, *A. umbellatus*, and *Antennaria neodioica*. As good representatives as any of the distribution of Subclass A are the familiar bog orchid, *Calopogon pulchellus*, the range of which is shown in plate 89, fig. 7, and the Red or Norway Pine, *Pinus resinosa*, the range shown in plate 89, fig. 8.

Subclass B. Carolinian Plants common to Newfoundland, Nova Scotia, Cape Cod and adjacent islands, Long Island, or coastal and southern New Jersey, but rare or unknown inland or in continental eastern Canada. **60 species = 7⅔ per cent** of the Newfoundland flora.

See Rhodora, xii. 92 (1910).

The plants of Subclass B are more restricted in their distribution than the more southerly elements of Subclass A, being confined to the silicious and boggy coastal strip represented by the New Jersey Pine Barrens, southern and eastern Long Island, Cape Cod and adjacent coasts, sandy portions of Nova Scotia, Sable Island, and silicious and other sterile areas of Newfoundland, only in the most exceptional cases found far inland or northward in New England or eastern Canada. Several of these plants are enumerated on p. 135, among the most notable of them being *Schizaea pusilla*, *Potamogeton Oakesianus*, *Ammophila arenaria*, *Carex hormathodes*, *C. silicea*, *C. sterilis*, *Juncus effusus*, var. *conglomeratus* Engelm. (known in America only from eastern Newfoundland, southeastern Connecticut, and the Pine Barrens of New Jersey), *Spergularia rubra*, *Arenaria peploides*, var. *robusta*, *Corema Conradii*, *Elatine americana*, *Hudsonia ericoides*, *Myriophyllum tenellum*, *Gaylussacia dumosa*, var. *Bigeloviana*, and *Utricularia clandestina*. The distribution of this group is represented on plate 90, showing the ranges of *Schizaea pusilla* (fig. 9) and of *Corema Conradii* (fig. 10).

CLASS IV. ENDEMIC PLANTS OR SPECIES UNKNOWN ON THE AMERICAN CONTINENT.

A small class, **16 plants = 2 per cent** of the Newfoundland flora, divided into

SUBCLASS A. ENDEMIC PLANTS. **8 plants = 1 per cent** of the Newfoundland flora, chiefly varieties of continental types.

SUBCLASS B. OLD WORLD TYPES AS YET UNKNOWN ON THE AMERICAN CONTINENT. **8 species = 1 per cent** of the Newfoundland flora.

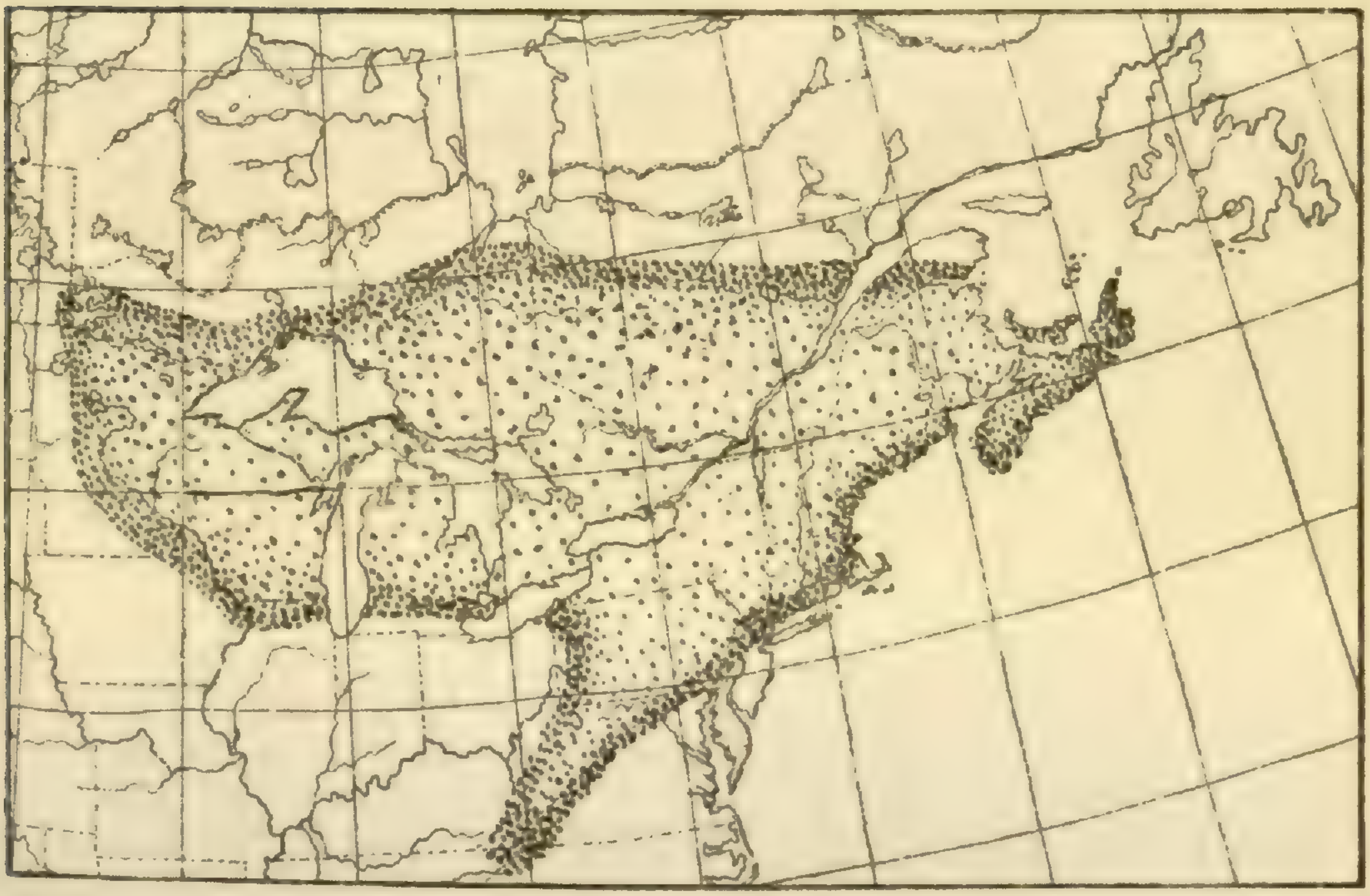
These plants, such species as *Montia rivularis* Gmel., *Saxifraga Geum* L., etc., are mostly either technical or obscure boreal species which are likely to be found in Labrador or are known from Greenland.

Briefly summarized, the analysis of the indigenous flora is

Class	No. of Plants	Per cent of Indigenous Flora
Class I. Boreal Types	466	59½
Class II. Western or Canadian Types not reaching Labrador	27	3½
Class III. Southwestern Types	274	35
Class IV. Endemic Plants or Species Unknown on the Continent	16	2
	783	100

9. Distribution of Schizaea pusilla.

10. Distribution of Corema Conradii.



11. Distribution of Aster macrophyllus.

The striking feature of this analysis is of course, as already stated, the fact that of the indigenous plants of Newfoundland 94½ per cent are identical either with species found to the north of the Straits of Belle Isle or with plants which occur along the Atlantic seaboard to the southwest; while only 3½ per cent are most typically Canadian plants which on the continent find their greatest development in latitudes and climatic zones parallel with those of central and southern Newfoundland. As previously suggested a very large proportion (340 + species) of the plants which abound on the continent at the western edge of the Gulf of St. Lawrence and which we should expect to find in appropriate habitats in Newfoundland seem to be quite absent from the island. I have spoken (p.115) of the absence from the calcareous valleys of Arbor Vitae and some of its regular associates. Besides these we have searched for in vain and others have failed to find in Newfoundland such very familiar species as *Adiantum pedatum*,[1] *Dryopteris marginalis*, *Sagittaria latifolia*, *S. arifolia*, *Alisma Plantago-aquatica*, *Poa Sandbergi* Vasey (one of the most abundant grasses on calcareous rocks of the Gaspé Peninsula), *Eleocharis obtusa*, *Carex stricta*, *C. lurida*, *C. retrorsa*, *Arisaema triphyllum*, *Veratrum viride*, *Lilium canadense*, *Trillium erectum*, *T. undulatum*, *Populus grandidentata*, *Ostrya virginica*, *Quercus rubra*, *Polygonum cilinode*, *Anemone riparia*, *A. canadensis*, *Clematis virginiana*, *Corydalis sempervirens* *Penthorum sedoides*, *Tiarella cordifolia*, *Chrysosplenium americanum*, *Dryas Drummondii* Richardson (which, in the Silurian regions of Anticosti and the Gaspé Peninsula, covers the river-gravels), *Prunus pumila*, *Dalibarda repens*, *Acer Saccharum*, *Viola septentrionalis*, *Pyrola asarifolia*,[2] *Steironema ciliatum*, *Mimulus ringens*, *Lonicera canadensis*, *Sambucus canadensis*, *Viburnum alnifolium*, *Eupatorium urticaefolium*, *Solidago squarrosa*, *Aster macrophyllus*, *A. acuminatus*, *Erigeron philadelphicus*, *Bidens cernua*, and *Prenanthes altissima*; these, as just said, only a few of the most conspicuous of 340 + such

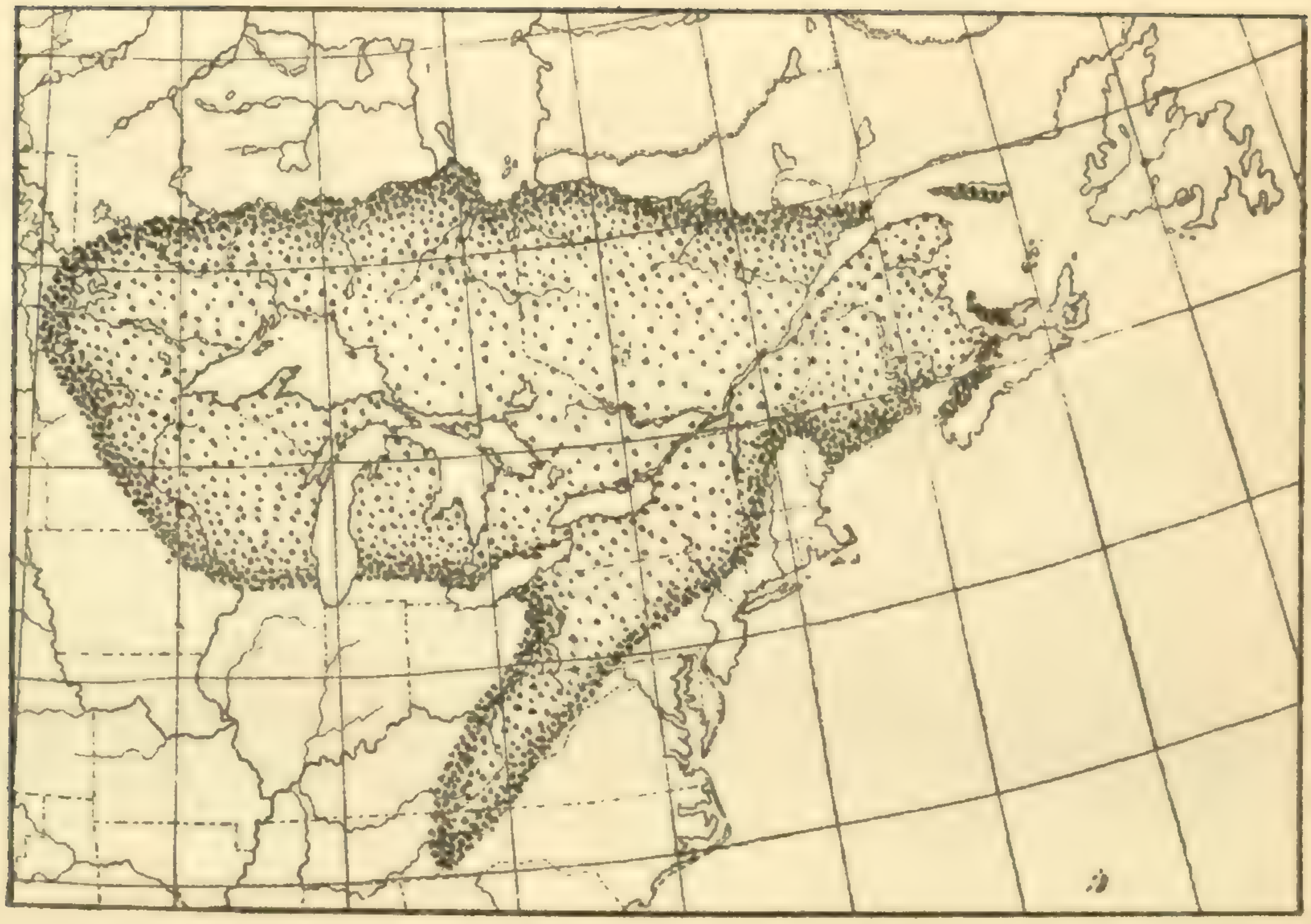
[1] La Pylaie naïvely states that the mountains north of Hare Bay have been named *Montagne du Capillaire*, because of the abundance there of *Adiantum pedatum* (Voyage, 3); but in Newfoundland the name *Capillare* is so generally used for *Chiogenes*, from the berries of which a highly esteemed preserve is made, that it is probable that this fruit was more concerned than *Adiantum* with the naming of the mountains. The only *Adiantum* known in Newfoundland is *A. pedatum*, var. *aleuticum* which is common on the serpentine barrens.

[2] *P. asarifolia*, var. *incarnata* which is a more northerly plant than typical *P asarifolia* occurs in western Newfoundland.

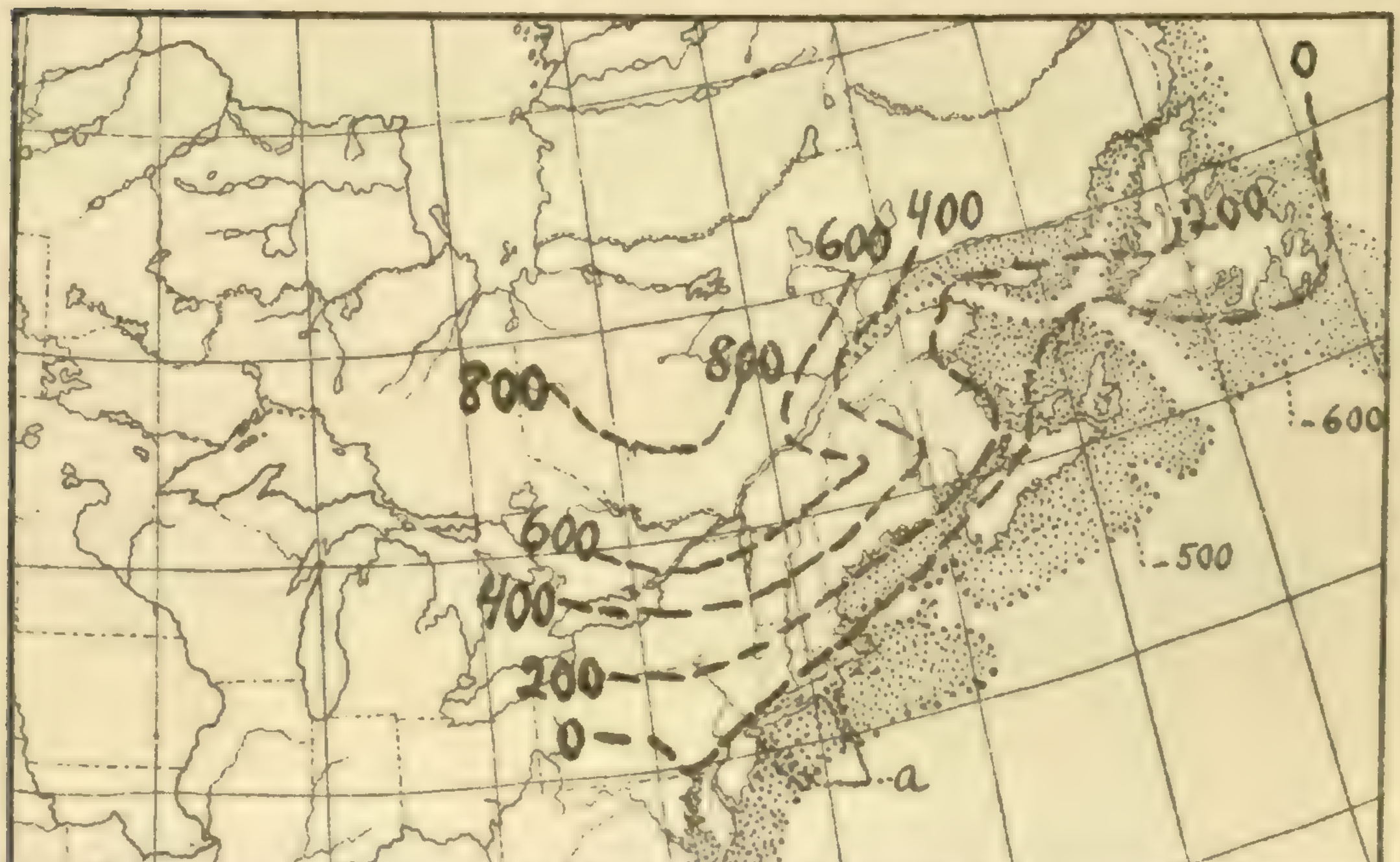
species, a large flora which on the continent occupies a fairly definite and broad belt between the Hudsonian element of Class I and the group of species embraced in Class III. Typical ranges of these Canadian plants are shown in plates 90 and 91, indicating the distribution of *Aster macrophyllus* (fig. 11), perhaps the most common Aster of the eastern Canadian forests, and of the Arbor Vitae, *Thuja occidentalis* (fig. 12), one of the most abundant and valuable trees of eastern Canada.

Here indeed is an anomalous situation. Although from the insular position of Newfoundland we should naturally expect that her flora would lack many species, it is certainly by more than a mere coincidence that the island lacks a large proportion of the most typical plants which on the mainland to the west abound in similar latitudes and under essentially identical conditions of climate and soil, but at the same time possesses so large a proportion of the Arctic-alpine flora mingled, often in closest proximity, with plants characteristic of southern New England, and even of the Cretaceous and Tertiary clays and sands of the New Jersey Pine Barrens. The presence on the island of the 466 Boreal plants of Class I ($59\frac{1}{2}$ per cent of the whole flora) is apparently simple to explain, for the northern peninsula of Newfoundland is separated from the Labrador Peninsula merely by the Straits of Belle Isle which are in many places only 11 or 12 miles across. The endemic plants and those not known upon the continent of North America (Class IV) may also be passed for the present since, when that country is better known, the latter will presumably be found in Labrador, and since the endemic plants are without exception minor variants or immediate relatives of continental types, showing that the flora of the island is of comparatively recent origin; in this resembling the flora of the Faeröes, a region which, as Warming states, forms "a strong contrast to other Atlantic islands, viz. the Azores, Madeira, and the Canaries, which are rich in endemic species, and have a flora which is very old, related to that of the Tertiary time; this can only be accounted for by the fact that no Glacial Period destroyed the old plant-world of these islands."[1] The greatest problem, and the only one with which we will at present deal, concerns Classes II and III, the typical Canadian flora which is very meagrely represented in Newfoundland, and the somewhat

[1] Warming: The History of the Flora of the Faeröes. Botany of the Faeröes, ii. 662 (1903).



12. Distribution of Thuja occidentalis.



13. Copy of a portion of de Geer's Map of the last Change of Level in Eastern North America. Broken lines are Isobases with 200 foot interval. Dotted portion, the submerged Coastal Plain. a. Submarine River-channels.

more Southwestern plants which together with the Boreal make up 94½ per cent of the flora of the island; a flora which, it is almost needless to say, must have reached Newfoundland since the receding toward the north of the Pleistocene glaciers.

Besides by human transportation there are five methods by which plants are commonly supposed to have reached islands: by transportation by birds, by ocean-currents, by floating ice and logs, by winds, or by having crossed on a formerly existing land-bridge. All of these methods may well have been effective in bringing to Newfoundland the plants of Group I, the Boreal types, but before accepting them as the sources of the floras of Groups II and III, the typical Canadian and the Southwestern plants, we may well consider them in some detail.

Birds. There has long been a strong tendency, based in part on the notes of Darwin and others, to believe that many difficult problems of plant distribution are to be explained by assuming that the seeds or fragments of the plants have been transported by birds. But it can only be said that the best evidence is opposed to this explanation of the origin of the floras of the more remote islands of the North Atlantic. In their exhaustive treatises on the sources of the Faeröese flora Warming and Ostenfeld, though diametrically opposed in their final opinions (the latter urging the necessity of a post-glacial land-bridge from Scotland to the Faeröes, the former maintaining that no such bridge is demanded), both affirm that the number of plants carried by birds over such distances are almost negligible. This conclusion is based upon the studies of two eminent Danish ornithologists and is so applicable to the present problem that I quote freely from both Ostenfeld and Warming. The former says:

"As I also [formerly] laid some stress on the migrations of birds (all the more, perhaps, because I held the other disseminating agencies to be of little value) I applied to an eminent Danish ornithologist, Mr. Knud Andersen, who has made a special study of the birds of the Faeröes,[1] and he very kindly gave me the information I wanted. .... If we consider how the migrating birds would carry the seeds with them, it can only be in one of two different ways, either in the alimentary canals or adhering to their beaks, feet or feathers. With

[1] Knud Andersen: Meddelelser om Faerøernes Fugle med saerligt Hensyn til Nolsø, I and II. (Vidensk. Medd. f. d. naturh. Forening i Kjøbenhavn 1898, p. 315, 1899, p. 239).

regard to this Mr. Andersen says that in Denmark during a period of 4–5 years the intestines of all the birds found at the lighthouses were examined with the result that all without exception were empty, i. e. *the birds migrate on an empty stomach.* Even if a bird had taken food just before it left the nearest land, Shetland, it would not retain it until it reached the Faeröes, as it takes at most a few hours to digest the food and the useless parts are doubtless ejected during flight. With regard to the seeds adhering to the birds, Mr. Andersen says that here also we must bear in mind that we are speaking of migrating birds, for while a bird shot in the fields may have clumps of earth, etc. (possibly with seeds) adhering to it, this has never been found to be the case with migratory birds on the move, and he again refers to the quantity of birds from lighthouses which he has had for investigation to support him in stating with some certainty that *migratory birds are almost always clean when they journey.*"

"Thus we see that an ornithologist is of opinion that *migratory birds are of hardly any importance as disseminators of plants.*" [1]

Warming, referring to Andersen's conclusions, supplements them with the conclusions of the Danish zoologist, Winge:

"For a number of consecutive years thousands of birds, picked up dead at the Danish lighthouses, have been sent to the Zoological Museum in Copenhagen, and notes on these dead birds have for many years been published annually by H. Winge in 'Videnskabelige Meddelelser fra Naturhist. Forening.' This eminent zoologist writes to me, in a letter dated March 27, 1903, as follows:— 'In one of the first years, the contents of the stomachs were systematically examined, later on only occasionally, but the stomach has always proved to be empty, only rarely some very slight traces of food have been found, viz. small pieces of the testa of seeds, etc. (besides, in some cases, a little sand or small stones, etc.). Though I have had thousands of dead migratory birds between my hands, and have made a habit of examining every single one, I have not as yet found any seeds adhering to the feathers, beaks, or feet. Small crusts or lumps of dried mud or clay occur fairly often on the beaks and feet of birds such as wading-birds, larks, starlings, etc.; whether these crusts or lumps contain microscopical germs, has not yet been ascertained (they may undoubtedly do so), but seeds, such as may be discerned by the naked eye or with a pocket-lens, have not been found.'"

[1] Ostenfeld, Botany of the Faeröes, I. 116, 117 (1901).

"As the above observations are made by so careful and eminent an investigator, I must consequently believe that birds at least very seldom carry seeds and other larger reproductive organs, and small plants, across great distances, and the indisputable evidences of birds carrying seeds either in them or adhering to them mentioned in books evidently apply to birds shot at or not far from, their daily haunts, and not to such as have just made a long journey. Winge also has observed a great many instances of birds carrying seeds across short distances."[1]

In view of the well known character of the work of Andersen and of Winge and the fact that it is confidently relied upon by so distinguished an advocate of the land-bridge theory as Ostenfeld and by the illustrious opponent of that theory, Warming, we can do no better than to acquiesce in their conclusion, that some method other than transportation by birds is required to account for the vascular flora of the Faeröes; and to conclude that in the case of the Newfoundland vascular plants (or at least of most of them) we must also seek a better explanation.

Ocean Currents. The most pronounced of the ocean-currents which skirt the eastern coast of North America are of course the Gulf Stream which as it drifts eastward off the coast of eastern New England, Nova Scotia and Newfoundland is far out to sea, and the Labrador Current which, coming from the North, is the shoreward current along the outer coast of Newfoundland, Nova Scotia and eastern New England. That the plants of New Jersey, coastwise New England and southern Nova Scotia could not reach Newfoundland by means of the south-flowing shoreward Labrador current needs no argument; and that the Gulf Stream, far offshore and washing no part of our coast north of the West Indies would be ineffective is perfectly obvious. Nor is Cabot Strait, the water separating Newfoundland from Cape Breton, adapted to transport seeds from the latter to the former region for, as shown by W. B. Dawson, the strong trend of the currents on the western or Nova Scotia side of this Strait is from the Gulf of St. Lawrence out to the open Atlantic; but on the eastern or Newfoundland side from the Atlantic into the Gulf.[1] And the very meagre representation in Newfoundland of the characteristic Canadian plants (27 species out of more than 367) which

[1] Warming, Botany of the Faeröes, ii. 676, 677 (1903).

abound on the west side of the Gulf of St. Lawrence shows clearly how ineffective have been the waters of the Gulf in transporting plants from Anticosti, the Gaspé Peninsula, New Brunswick and Cape Breton to the Newfoundland shores. Even the current of the gigantic lower St. Lawrence River has been surprisingly ineffective in this transportation, for not only do the 340 typical Canadian plants which are unknown in Newfoundland nearly all occur along the lower St. Lawrence whence, theoretically, their seeds, fruits or other fragments might be washed to the Newfoundland side of the Gulf; but of the 274 species which comprise our Class III, the Southwestern plants, not any of those which grow along the upper St. Lawrence but are unknown in easternmost Quebec show, so far as indicated by my daily recorded observations for many summers on the lower St. Lawrence, any evidence of extending their ranges from their continuous areas of distribution to points farther down the river. Many other plants, furthermore, such as *Dryopteris cristata*, *Pinus resinosa*, *Carex vulpinoidea*, *Juncus tenuis*, *Salix humilis*, *Spiraea latifolia*, *Rosa virginiana*, *Ilex verticillata*, *Hypericum boreale*, *H. virginicum*, *Aralia hispida*, *Sium cicutaefolium*, *Cornus circinata*, *Pyrola americana*, *Scutellaria galericulata*, *Chelone glabra*, *Viburnum cassinoides*, and *Solidago rugosa*, while extending in a comparatively solid phalanx across New England and southern Quebec as far east as Temiscouata, Rimouski or western Matane County, where the St. Lawrence has become sea-like and decidedly saline, have failed to find successful anchorage farther down the St. Lawrence, along the north shore of the Gaspé Peninsula or on Anticosti Island, although many of them extend northward along the coast from eastern New Brunswick to the north shore of the Baie des Chaleurs. This fact is further emphasized by an examination of Dr. Schmitt's catalogue of the vascular plants of Anticosti,[3] which enumerates a large number of species but, with the possible exception of *Dierrilla Lonicera*, not one of them such as seem to have been stranded on the island from areas far up the St. Lawrence.[1] It is thus apparent that, although our small rivers are

[1] See A. T. Drummond: Currents and Temperatures in the Gulf of St. Lawrence. Can. Rec. Sci., vii. 54 (1896).

[2] Schmitt, Monographie de l'ile d'Anticosti, 159–234 (1904).

[3] Schmitt's *Ranunculus Harveyi*, *Thalictrum divicum* [*dioicum*], *T. purpurascens*, and *Viola rostrata* are unquestionably listed though errors of determination, since these are all plants of far more southern or inland areas. His *Ranunculus Harveyi* (real *R. Harveyi* is confined to Missouri and Arkansas) is possibly *R. Allenii* Robinson; his

often highly efficient in transporting and distributing plants or their fragments or fruits, the broad lower St. Lawrence, like a great drifting sea, accomplishes little toward populating the shores near its mouth with the plants from farther up-stream; and in this service not only the current of the St. Lawrence but the currents in the Gulf have been conspicuously ineffective in carrying to Newfoundland the plants which abound on the continent.

Floating Ice and Logs. These may well be efficient in bringing boreal plants upon the coast of Newfoundland, but for the reasons explained in the consideration of ocean-currents they apparently have carried few if any southwestern types to the island.

Winds. Warming feels that in case of the Faeröes winds are sufficient to have carried upon those islands most of the plants they have received from Scotland, but Ostenfeld urges that many species have seeds too heavy for ready transportation by this means. In the case of Newfoundland it is perfectly reasonable to suppose that the plants of Class I, the Boreal Species, which, as we have seen, might readily be brought from the Labrador side of the Straits of Belle Isle by birds, ocean-currents or floating ice and logs, could as readily have been transported by the winds; for the distance is so slight that the light seed (or spores) — of *Botrychium Lunaria*, *Lycopodium Selago*, *Eriophorum Chamissonis*, *Salix*, *Populus balsamifera*, etc.— might readily be wafted across, and the dried fragments or heavier fruits of other plants blown across on the comparatively short ice-bridge formed in severe winters. But the distance across Cabot Strait, the shortest route from the southwestern mainland to Newfoundland is fully 70 miles, and, although this does not seem a forbidding gap, the fact remains that very many common Canadian species with fine spores or with the seeds plumose, feathery or otherwise adapted for wind-transportation have failed to cross from Cape Breton to southwestern Newfoundland. Among such plants perfectly adapted, it would seem, for wind-transportation, at least in heavy gales or in winter when advantage can be taken of broad fields of ice, are *Lycopodium sabinaefolium*, *Adiantum pedatum*, *Dryopteris marginalis*, *Pyrola elliptica* and *Chimaphila umbellata*, with very minute spores

Thalictrum dioicum probably *T. confine* which is a characteristic plant about the Gulf of St. Lawrence; his *T. purpurascens* (a species unknown as far east as New England) is undoubtedly the common *T. polygamum* which he does not list; and his *Viola rostrata* (a woodland species very rare east of the Connecticut valley) is more likely *V. labradorica*, *arenaria*, or *adunca*, all of which occur about the Gulf of St. Lawrence.

or seeds; and *Populus grandidentata, Clematis virginiana, Acer Saccharum, Epilobium molle, Apocynum cannabinum, Asclepias Syriaca, Eupatorium perfoliatum, E. urticaefolium, Solidago squarrosa, S. latifolia, S. juncea, Aster macrophyllus, A. cordifolius, A. acuminatus, Erigeron philadelphicus, Gnaphalium polycephalum* and *Prenanthes altissima* with feathery pappus or other means of buoyancy. And even though the buoyant-seeded plants of Nova Scotia have, since the receding of the Pleistocene ice, failed to reach by means of the winds the opposite side of Cabot Strait, there are plenty of other very common plants of Cape Breton or Nova Scotia proper — such as *Leersia oryzoides, Carex lurida, C. retrorsa, Veratrum viride, Ostrya virginica, Polygonum cilinode, Osmorhiza divaricata* and *Steironema ciliatum*,— the bladdery fruits, light seeds, or dry seed-bearing fragments of which it requires no extreme stretch of the imagination to picture as blowing and bounding on the broad fields of ice finally to find lodgment on the Newfoundland shore. But theoretically simple as this process appears, such conspicuous plants of the Canadian zone seem to have failed utterly in thus crossing Cabot Strait; and if this shortest route to Newfoundland has proved too much for the Nova Scotian species it is quite obvious that the routes from Anticosti (110 miles) and the Gaspé Peninsula (more than 200 miles) are no more efficient. Otherwise we should expect to find upon Newfoundland such very common and conspicuous plants of Anticosti or Gaspé as *Anemone multifida, A. riparia, Clematis verticillaris, Arabis brachycarpa, Dryas Drummondii, Astragalus frigidus*, var. *americanus, Pyrola asarifolia, Erigeron acris*, var. *asteroides, Arnica mollis, A. chionopappa*, and *Prenanthes racemosa.*

Surely, if nearly all the plants (340 + out of 367 + species) which today abound in eastern Canada in the latitudes of Newfoundland (with the exception of the northern peninsula) but which are not characteristic of the sandy coastal country to the southwest, have thus signally failed to reach the island by means of the winds, is it not obvious that such a method for the transportation of *Schizaea pusilla*, for example, from New Jersey to Nova Scotia, thence to Newfoundland, or of the other southwestern plants which compose our Class III, is highly improbable? In fact, from the size and weight of the seeds or fruits of many of these Southwestern Types which are perfectly at home in Newfoundland — for example, *Sparganium diversifolium, Potamogeton Oakesianus, Carex folliculata, Carex in-*

tumescens, *Corylus rostrata*, *Castalia odorata*, *Pyrus arbutifolia*, var. *atropurpurea*, *Rosa virginiana*, *Corema Conradii*, *Ilex verticillata*, *Viola cucullata*, *Aralia hispida*, *Sanicula marilandica*, *Cicuta bulbifera* (reproduced by bulblets), *Cornus alternifolia*, *Gaylussacia baccata*, *G. dumosa*, var. *Bigeloviana*, *Vaccinium macrocarpon*, *Convolvulus Sepium*, and *Melampyrum lineare* — it is difficult to see how the winds could have had any efficient part in transporting them from the continent to Newfoundland.

Not only is the flora of Newfoundland composed of boreal and southwestern species with only a very meagre representation of the typical Canadian species but the fauna shows a similar composition. There are several animals, the caribou, marten, Arctic hare, ptarmigan, etc. closely akin at least to Arctic-alpine or Hudsonian species of Labrador, but the moose, porcupine, squirrels, mice, spruce partridge, and many other conspicuous animals of our Canadian forests are unknown; and Mr. Outram Bangs and Dr. Glover M. Allen inform me that the only native mouse of Newfoundland, instead of being one of the common woodland species of eastern Canada, is *Microtus terrae-novae*, the Newfoundland vole, which is closely akin to the Meadow Mice of our New England coast, and that the muskrat of Newfoundland (*Fiber zibethicus obscurus*) is very close to the muskrat (true *Fiber zibethicus*) of our continental swamps and pond shores, a species unknown from Labrador.

As we have already seen, the possibility of the southwestern coastal plants reaching Newfoundland from Nova Scotia by means of birds, ocean-currents, floating logs and ice, or by winds is very slight indeed if not entirely negligible. And surely these agencies would hardly be likely to transport to Newfoundland the vole or the muskrat, neither of which would be apt to undertake long water-journeys. We are therefore ready to consider the possibilities of the flora and at least the southern mammal-fauna of Newfoundland having reached the island by the method which we have not yet discussed, viz. by crossing on a

Post-Glacial Land Bridge. We here approach a problem upon which there is little direct geological or at least paleontological evidence, and many geological friends whom I have consulted are disinclined, from the meagreness of the geological record, to express a final opinion in the matter. But the botanical evidence, at least, is very extensive and of a rather striking nature. The isolation

at northeastern stations of Pine Barren and other Coastal Plain species is by no means confined to Newfoundland. In 1880 Professor N. L. Britton [1] called attention to the fact that many of the plants of the New Jersey Pine Barrens extend northeastward upon the Cretaceous soil (but not on the Drift) of Staten Island, and across Long Island to the similar soils of southern New England; and gradually our knowledge of these northeastern outliers of the flora of the Pine Barrens and even of more southern highly silicious areas of the Coastal Plain has increased until (omitting from consideration all plants which reach Newfoundland) we now know 118 such species which, northeast of Long Island, have remote outlying stations along the coastal strip of New England or the Maritime Provinces, and every season of botanizing is adding one or more species to the list from Prince Edward Island, eastern New Brunswick, Nova Scotia, eastern Massachusetts, Cape Cod, Marthas Vineyard, Nantucket, Rhode Island or southeastern Connecticut. A few examples will make clear this class of cases, 118 species, as already said, besides those which constitute our Class III, Subclass A of the Newfoundland flora. *Sabatia dodecandra* (*S. chloroides*), the splendid rosy pink gentian of coastal pond-shores from North Carolina to eastern Massachusetts, is quite unknown on the continent northeast of Cape Cod or north of Bristol and Plymouth Counties, Massachusetts, but on that remarkable isolated sand ridge and plain, Sable Island, 100 miles out to sea from the southeast coast of Nova Scotia, it is "the chief annual" in the flora.[2] *Aster subulatus* is a characteristic plant of coastal flats from Florida to New Hampshire, is quite unknown on the coast of Maine, southern New Brunswick or Nova Scotia, but reappears (with other southern species) in great profusion on the broad flats at the mouth of the Nepisiguit River as it enters the Baie des Chaleurs in northeastern New Brunswick. *Ilex glabra*, the Inkberry of coastal swamps from Louisiana to Florida and the Atlantic coast as far north as the region of Dorchester Bay, south of Boston, occurs 30 miles away in an isolated area of swamps in Wenham and Magnolia, its most northeasterly station in the United States, but it reappears in sandy swamps of southwestern Nova Scotia. *Magnolia virginica* of our southern Atlantic coast extends northward across New Jersey

[1] N. L. Britton: On the Northward Extension of the N. J. Pine Barren Flora on Long and Staten Islands. Bull. Torr. Bot. Cl. vii. 81–83 (1880).

[2] J. Macoun, Geol. Surv. Can. n. s. xii. 218 A (1902).

to Suffolk County, Long Island, but is unknown east of Long Island except in the famous swamp on Cape Ann (120 miles in a straight line from the nearest Long Island station) where it has been known since the days of Menasseh Cutler. *Betula nigra*, the River or Red Birch so characteristic of swamps and river-banks from Texas to Florida and throughout the lower Mississippi region, extends up our coastal plain to Suffolk County, Long Island, but, save along the lower Merrimac and adjacent regions of southern New Hampshire and northeastern Massachusetts, 115 miles from the Long Island area, is unknown in New England. *Echinodorus tenellus* is found at various stations in the Mississippi valley and about the Gulf of Mexico and the southern coast, but northeast of Canterbury, Delaware, is known only around ponds of Middlesex County, Massachusetts (a gap of 340 miles). *Scirpus Hallii*, originally described from Texas, is abundant on the shores of Winter Pond in Middlesex County, Massachusetts, but, though it is the most distinct and easily recognized species of its subgenus, it is unknown elsewhere in the Atlantic states north of Decatur County, Georgia, and Indian River, Florida, 1115 miles away. These few cases, as said, are typical of this large class of plants, for were the ranges of the remainder of the 118 species very closely scrutinized similar broad gaps in their northern distribution would be quickly apparent— such very local plants in our flora as *Lycopodium alopecuroides, Najas quadalupensis,*[1] *Panicum verrucosum, P. scoparium,*[2] *Leptochloa fascicularis, Eleocharis interstincta,*[3] *E. quadrangulata, E. Torreyana, E. tricostata,*[4] *Scirpus Longii,*[5] *Rynchospora Torreyana,*[6] *Scleria reticularis, Carex ptychocarpa, C. subulata, Orontium aquaticum, Juncus brachycarpus,*[7] *J. aristulatus, Saururus cernuus, Rumex hastatulus, Sagina decumbens, Linum floridanum, Ilex opaca, Ascyrum hypericoides, Opuntia vulgaris, Cuscuta arvensis, Stachys ambigua,*[1] *Gerardia parvifolia, Viburnum venosum, Sclerolepis*

[1] See Bicknell, Bull. Torr. Bot. Cl. xxxv. 60 (1908).
[2] See Hitchcock & Chase, Cont. Nat. Herb. xv. 295 (1910).
[3] See Wiegand, Rhodora, xi. 83 (1909).
[4] See Bicknell, Bull. Torr. Bot. Cl. xxxv. 480 (1908).
[5] See Rhodora, xiii. 6 (1911).
[6] See Rhodora, x. 142 (1908); also Bicknell, Bull. Torr. Bot. Cl. xxxv. 483 (1908).
[7] See C. B. Graves, Rhodora, iv. 27 (1902); and G. G. Kennedy, ibid. 60. Dr. Kennedy's observation that at Scituate, Massachusetts, *Juncus brachycarpus* grew "in a patch of peculiar reddish soil quite different from the general soil of the ridge. The gravel was in small equal sized particles with a peculiar greasy feeling to the hand: and neither the plant nor the soil were observed elsewhere," is peculiarly interesting, since Professor Isaiah Bowman has shown (Science, n. s. xxi. 994) that at Scituate

uniflora,[2] *Eupatorium leucolepis*,[3] *Gnaphalium purpureum*, and *Coreopsis rosea*.

In 1893, Dr. Arthur Hollick, in a significant paper entitled *Plant Distribution as a Factor in the Interpretation of Geological Phenomena, with Special Reference to Long Island and Vicinity*,[4] accounted for the presence on Long Island, Martha's Vineyard, Nantucket and Cape Cod of the Pine Barren plants by demonstrating that after the receding of the Pleistocene ice there existed a land connection along the shoreward margin of the old coastal plain, which now forms the coastal bench extending gradually offshore until at a depth of about 100 fathoms — 600 feet — it abruptly meets the deeper waters of the open Atlantic. Hollick's statements bear so directly on our problem that I quote freely from them: —

"During Cretaceous and Tertiary times a series of fresh water or estuary and marine deposits (clays, sands, gravels and marls) were laid down along the eastern borders of the North American continent. About the close of the Miocene, or the beginning of the Pliocene period, an era of elevation began which finally raised them hundreds, in places thousands of feet, above their present level, forming a vast coastal plain, which extended over the entire area where we now find them, and for a considerable distance eastward, into what is now part of the bed of the Atlantic ocean. On the land side this plain was bounded by the crystalline and Triassic rocks of Connecticut, southern New York, New Jersey, Pennsylvania and southward. . . . The evidences of its extension northward around Rhode Island and Massachusetts are now almost obliterated, but there seems to be every reason to believe that its land limits were approximately the coast line of the present day. . . .Further north than Massachusetts, are found beds of Pre-Pleistocene deposits, the uppermost being bright red sands. Dr. Kennedy's station for *Juncus brachycarpus* is at "Egypt," where there are some other Coastal Plain plants, Dr. Bowman's outcrop of Pre-Pleistocene red sands and clays at Third Cliff (about four miles south of "Egypt") where it "outcrops for a half-mile along the cliff face." It is desirable to watch at Third Cliff for the *Juncus* and other Coastal Plain species and it may be that remnants of the Coastal Plain occur nearer to Boston than at Third Cliff.

[1] See Wiegand, Rhodora, xi. 83 (1909); and Fernald, Rhodora, xii. 191 (1910).

[2] See F. T. Lewis, Rhodora, vii. 186 (1905); and J. F. Collins, Rhodora, xii. 13 (1910).

[3] *Eupatorium leucolepis* was collected at Kingston, Massachusetts, by W. P. Rich and C. H. Knowlton, August 30, 1908.

[4] Trans. N. Y. Acad. Sci. xii. 189–202 (1893).

so far as I am aware, it is not even indicated, and except for the presence of the well-recognized submerged plateau off our eastern shores all further trace of the former coastal plain is lost. Its eastern limits, where it formerly met the waters of the Atlantic ocean, were probably where we now find the borders of this plateau to be, namely, at the 100 fathom contour."

"Shortly after the advent of the Ice Age the elevation had reached its maximum. The rivers had previously cut deep valleys through the easily eroded material forming the coastal plain, in their courses to the sea, and when the continental glacier, pushing its way southward and eastward, finally flowed over the edges and escarpments of the hard crystalline rocks onto the soft and incoherent material of the coastal plain it scooped it out to a great depth in places, and then, either carrying it forward in mass, or else pushing and squeezing it ahead in a great contorted ridge, capped by the boulder till, finally left it as part of the terminal moraine. . . ."

"Just when the period of elevation ended and that of depression began, in fact, whether it was previous to, or subsequent to that of greatest ice accumulation, is yet a matter of controversy between authorities, but in either case on the retreat of the glacier, we may picture to ourselves the terminal moraine forming an elevated ridge extending through Staten Island, Long Island and the islands to the eastward, forming a continuous, more or less elevated land connection to the north and east, with what remained of the coastal plain sloping away from it on one side and a trough filled with the water from the melting glacier on the other. . . ."

"The present rate of coastal subsidence, as calculated by Prof. Geo. H. Cook, and other authorities, is about two feet per century. At this rate, six thousand years ago practically the whole of the area included within the present twenty-fathom contour would have been above sea level — only the deepest parts of the trough of the Sound being below it. . . . This area, as may readily be seen, includes the whole of Staten Island, Long Island, Block Island, Martha's Vineyard and Nantucket, besides a respectable portion of the submerged coast eastward and southward. It is also probable that at least a part of this area to the eastward, which at the present time is lower than the twenty fathom contour, has become disproportionately so in modern times by tidal scouring, and that it was actually and relatively higher formerly than now."

"Under these circumstances we should, therefore, have had, during a considerable period of time, a continuous strip of land, except for the river outlets, all the way from New Jersey to Massachusetts, separated from the mainland by a body of water occupying the trough scooped out by the glacier, which, in its present depressed and widened condition, we now call Long Island Sound, but which was then a fresh water lake or broad river. Bearing these conditions in mind we next have to consider the still further subsidence of the Champlain Period, the re-elevation of the Terrace Period, and the depression which is again going on at the present day. It is evident that at some time during these oscillations of level the sea, having eaten away the coastal plain, finally reached the barrier of the terminal moraine, where this still remained as the connecting link between Long Island and Massachusetts. The moraine gave way in places, channels were formed and detached portions remained to form the islands which we recognize today as Block Island, Martha's Vineyard, Nantucket and the host of other lesser islands which stream out from the end of Long Island towards Cape Cod and the Rhode Island shore, while the eroded portions are represented by the great submerged ridges which are known as the Nantucket and other shoals."

"....it is evident that our theory implies the continued existence of land connection, between New Jersey and southeastern New England, by way of Long Island, during a sufficient period of time after the final recession of the glacier, for the pine barren flora to have spread and become established there....Long Island, Block Island, Martha's Vineyard, Nantucket, etc., as we now know them, have not been submerged since the final retreat of the glacier, and their separation into islands by the submergence of the intervening land is a comparatively modern phenomenon, due to the depression and erosion which are actively at work, and which have produced such conspicuous results during the historic period." [1]

Dana, reviewing in 1894 the botanical evidence, said: "The migration northward of the Pine Barren flora must have been during the latter part of the time of high latitude elevation..... Each stage in the retreat was a contraction of the area of perpetual frost, and a widening of the range of tropical winds, ensuring further encroachment. In view of all the facts, it is probable that before the subsidence had

[1] Hollick, l. c. 196–201 (1893).

made large progress, the ice-sheet had retreated to Canadian territory, excepting the portions left about the higher mountains of eastern and western America."[1]

In 1908, the late John H. Sears,[2] accounting for the presence in Middlesex and Essex Counties of isolated southern plants, cited Dana's discussion of the occurrence in Northumberland Strait and at other points north of Cape Cod of a southern mullosk fauna in which Dana had concluded that, since "none of the shells are found in elevated beaches; ...the migration from south of Cape Cod took place in the Recent period. Such a migration, extending to the St. Lawrence Gulf, was not possible, unless the Labrador current had first been turned aside; and a closing of the Straits of Belle Isle would have brought this about. This implies an elevation of about 200 feet; and it may be that the rise which introduced the Recent period carried the continent, to the north, to this height above the present level. In the Champlain period of subsidence the Straits were open, this being proved by the cold-water shells of the now elevated beaches."[3] And basing his conclusions in part on the presence of the southern plants — *Echonodorus tenellus*, *Scirpus Hallii*, *Betula nigra*, *Magnolia virginiana*, etc., in part on the occurrence in coastal muds of Essex County of southern invertebrates, Sears concluded that the southern flora (and fauna) reached northeastern Massachusetts during the elevation which followed the Champlain subsidence.

Thus, by Hollick's interpretation, which was accepted by Dana (who placed their migration and that of the mullosks of Northumberland Straits at different times) the southern plants reached Cape Cod in "the period of Glacial emergence which made New Jersey, Staten Island, Long Island, with the islands east of it and southern New England, continuous dry land....long before the alleged subsidence had completed its work"[4]; while by Sears the time of the migration of the southern plants is placed after the Champlain subsidence. The final weighing of the more detailed geological evidence must of course be left in other hands, but it is possible that on the more general question we may gain some light by further investigating the origin of the southern flora of Newfoundland.

[1] Dana, Man. Geol. ed. 4, 980 (1894).
[2] J. H. Sears: A Southern Flora and Fauna of Post-Pleistocene Age in Essex County, Massachusetts. Rhodora, x. 42–46 (1908).
[3] Dana, l. c. 995.
[4] Dana, l. c. 995.

In the accounts above quoted of the extension to Massachusetts of the Coastal Plain plants no direct mention is made of one very important item. This is the amount of water which would necessarily have been withdrawn from the ocean in order to form the tremendous masses of ice which, as is now becoming apparent, extended simultaneously over large areas of both the northern and the southern hemispheres. Professor Reginald A. Daly, to whom I am indebted for references to papers on this subject, says: "At the time of their maximum extension the ice-sheets, which have since melted away, covered a total area which may be estimated as from five to eight millions of square miles."[1] And though there is great diversity in the estimates of the average thickness of the ice and consequently of the corresponding decrease in the depth of the ocean with the resultant lowering of sea-level all over the globe, some idea of the magnitude of this change can be gained by the following extracts from students of the subject.

Penck, in 1894, wrote: "The causes of the general rise of sea-level in the latest geological time might perhaps be connected with those climatic changes which the earth underwent in the Glacial period. If, during that time, northern Europe, northern North America, and the Antarctic regions were simultaneously glaciated, a considerable mass of water must have been removed from the ocean, and, if the thickness of ice be assumed as 1,000 meters, the sea-level must have been 150 meters below its present position."[2]

Daly, in 1910, felt that these former estimates were too great and that "the formation of the ice-sheets (which have since disappeared) would produce a negative movement of sea-level in low latitudes to an amount ranging between twenty-five and forty-five fathoms."[3]

Besides the direct removal from the ocean of water sufficient to form the ice, there is a second factor which must be taken into account. This is the gravitative power of the great masses of ice. Using the formulas of R. S. Woodward,[4] Daly calculates that "if the ice had an area of 6,000,000 square miles and an average thickness varying from

[1] Daly: Pleistocene Glaciation and the Coral Reef Problem. Am. Jour. Sci. ser. 4, xxx. 299 (1910).

[2] Penck, Morphologie der Erdoberflaeche, ii. 660 (1894) as translated by Daly, l. c. 298.

[3] Daly, l. c. 300.

[4] Woodward: On the Form and Position of the Sea Level. U. S. Geol. Surv. Bull. 48 (1888).

3,000 to 5,000 feet, the attraction of the ice would lower the level of the equatorial sea by amounts ranging from five to eight fathoms." Consequently, when the front of the northern ice-sheet extended along the coast of New England, the attraction of the ice would tend to some extent to compensate for the negative change of our sea-level produced by direct extraction of water from the ocean; but as the ice-front receded farther and farther to the north the belt of ice-attracted water would shift with it, and when New England, the Maritime Provinces, and Newfoundland were quite free from the ice-sheet and the front of the latter had receded to a point on the Labrador Peninsula, the northward moving rim of heightened water would have passed beyond us and our coast-line would feel little positive effect from this source.

If we now examine a chart showing the contours of the coastal bench which extends as a submerged fringe off the eastern coast of North America and which represents the old land-border of the continent, we shall see that in some places, for instance at Nantucket Shoals and Georges Shoal, the bench comes to within 2 or 3 fathoms of the ocean-surface, while 100 miles off Canso in eastern Nova Scotia, Sable Island rises above the water as a long sand-ridge fully 100 feet high. In many areas — the bench all the way from the coast of the South Atlantic States to Georges Bank, then Brown's Bank, then the coastal banks around western and southern Nova Scotia, Sable Island Bank, the Banquereau, St. Pierre Bank, etc.— there are portions of the old land-border forming an almost continuous chain of submerged plains which, even 100 miles out to sea, show soundings of only 25 to 44, often as low as 10 or 15, fathoms. If we trace the line of soundings which reveals the submerged coastal plain at a depth of 60 fathoms, we shall find that only the very deepest channels, such as the outlet from the deep Gulf of Maine (now 25 miles wide) between Georges Bank and Brown's Bank, or Cabot Strait between Cape Breton and the Banquereau on the west and Newfoundland and St. Pierre Bank on the east, interrupt the continuity of the coastal bench.

Now, if we concede the withdrawal of water from the ocean to form the ice of the Glacial Period and disregard for the moment the possibility of any other change in the level of the coast, it will be obvious that vast areas off our present shore must have their ocean-water withdrawn. If we take Penck's view that "the sea-level must have been 150 meters [492 feet or 82 fathoms] below its present position"

almost the entire coastal bench, cut through only by the deepest channels such as that from the Gulf of Maine and Cabot Strait, would have been dry land. But if Daly's more conservative figures ("between twenty-five and forty-five fathoms") are taken it is apparent that, although much of the coastal bench would have been dry land, there would have been innumerable shallow channels between the uncovered areas.

Furthermore, it is quite apparent that the height of the now submerged coastal bench, composed of friable deposits augmented by great masses of loose terminal moraine material, must, during and after its submergence, have been tremendously reduced not only by the denuding action of the waves but by the strong water-currents aided by the winds. We can gain some conception of this rapid reduction of the height and area of these remnants of the old coastal plain by observations made on Sable Island. In his account of Sable Island, Professor John Macoun said: "When the Admiralty survey of the island was made in 1799 it was found to be thirty-one miles long and two broad, though according to the older French charts it had been forty miles in length and two and one quarter in breadth. Lieut. Burton, who surveyed the island in 1808, found it to be thirty miles long and two wide".[1] In 1855, according to Sir William Dawson, the island was "about 23 miles in length, and from one mile to one and a half in breadth."[2] Des Barre's charts of 1779 show that some of the hills (not the highest he stated) were 146 feet above sea-level. Today the charts show an island less than 22 miles long, and according to Macoun the highest hills "are now but little over 100 feet" in height. Macoun further says in regard to Sable Island: "The popular opinion that as it wastes in one part it makes in another is fallacious. Another erroneous idea is that the wind wastes the hills and levels the land and causes destruction. The wind is a builder and the sea is the leveller. The wind certainly shifts the sand but it cuts out in one place only to build up in another. By it the sand is blown inward, but none to sea, except perhaps to a small extent during a very heavy gale. On the other hand, the currents that are set in motion by the winds, and others of a permanent character, are constantly cutting away the sand and carrying it out to sea, and if

[1] Macoun, Geol. Surv. Can., Ann. Rep. n. s. xii. 213, 214A (1902).
[2] Dawson, Acad. Geol. 380 (1855).

a high tide should throw some of this back, which it often does, the wind, by blowing this inward, at once begins to build up new hills."

It is apparent, then, that during the maximum development of the last ice-advance (the Wisconsin of glacial geologists) a very large portion of our coastal bench must have been above the sea-level of that time, forming, as it were, a broad sand-bar off the mouth of the Gulf of Maine at least to the edge of Georges Bank. Opposite this to the east would have been another continuation of the sandy belt running along the Nova Scotia coast and across Sable Island Bank and the Banquereau to Cabot Strait, with St. Pierre Bank beyond. In fact, since the ice-action was very slight about the Gulf of St. Lawrence and there is no evidence of ice-action on the Magdalen Islands, it is safe to assume that the channel from the Gulf of St. Lawrence (Cabot Strait) was not then of nearly such depth and breadth as at the present time. Then when the ice began to recede and the water from its melting (impeded in its progress seaward by various barriers) began to return to the ocean, the deeper channels would first become filled and not until the ice-front had reached a comparatively high latitude would the more elevated portions of the coastal bench become submerged.

Here, then, would be a strip of sands and similar soils stretching with only slight interruptions from our South Atlantic coast to Newfoundland, and it is probable that not far in the wake of the receding ice and the more boreal plants and animals the Coastal Plain plants with the Newfoundland vole and the muskrat crossed on this sandy bridge to Newfoundland, though some other plants and animals which farther south occur with them or to which they are closely related — *Sabatia dodecandra*, *Ilex glabra*, etc.— failed to cover the entire distance. Although many of the plants which seem thus to have reached Newfoundland belong to southern or even sub-tropical groups and on the continent find their great development from Cape Cod to Texas or even eastern Mexico, it is apparently unnecessary to assume that at the time of this migration the southeastern edge of the ice was far north of Newfoundland or even had fully receded from the island. For to-day, with arctic ice often fringing far into the summer the eastern and northern portions of Newfoundland, and snow and ice lying until mid-July or even through the drier summers upon the bleak slopes, *Schizaea pusilla* and *Xyris montana*, isolated representatives of large tropical families, and *Bartonia iodandra*, an essentially endemic

outlier of a southern Coastal Plain genus, fruit profusely among the tussocks of *Scirpus caespitosus* and other Arctic species on the highest alpine barrens of Newfoundland; and *Potamogeton Oakesianus* is there as thoroughly at home with *Sparganium hyperboreum* of Greenland as on Nantucket [1] with *Najas guadalupensis*.

The withdrawal from the ocean of a great body of water to form the Pleistocene glaciers and the gradual restoration of it to cause the submergence of our coastal bench give us, then, a sufficient basis upon which to build the land bridge necessary to carry the Coastal Plain plants, the muskrat and the vole to Newfoundland, and gradually to isolate them upon that island. But other factors may have had to do with the former height of the coastal bench. For instance, in his paper *On Pleistocene Changes of Level in eastern North America*, Baron Gerard de Geer [2] shows that although in the later Pleistocene submergence the ocean covered areas which now are far above sea-level (Mt. Desert Island with late Pleistocene beaches at 210 feet on the hills; St. John, New Brunswick, at about 269 feet; Dalhousie, New Brunswick, at 174 feet; Rivière du Loup at 373 feet; with points farther inland showing beaches at 600–800 feet), southeast and east of this now uplifted region there is a belt including Perth Amboy (New Jersey), Long Island, Martha's Vineyard, southeastern Massachusetts, southern, central and eastern Nova Scotia, eastern Prince Edward Island, the Magdalen Islands, and the southern margin of Newfoundland, which shows no sign of Post-Pleistocene uplift. This line (de Geer's isobase for zero) south of which no evidence has been found of recent elevation is so nearly coincident with the northern line of our supposed land-bridge that the eastern portion of de Geer's map is here reproduced (plate 91, fig. 13), with the omission of the colors and some inland features which do not bear directly on our problem. And, although inland from de Geer's isobase for zero the land has clearly been elevated since Glacial times,[3] Professor J. B. Woodworth, who has kindly helped me to several references, informs me that he knows no evidence of Post-Glacial elevation south of that isobase but that, whatever may be the changes at present going on, there are many evi-

[1] "It [*Potamogeton Oakesianus*] is exceedingly abundant in some of the small ponds of Nantucket, where it fruits very freely." — Morong, Mem. Torr. Bot. Cl. iii. No. 2, 15 (1893).

[2] De Geer, Proc. Bost. Soc. Nat. Hist. xxv. 454–477 (1892).

[3] Recent observations have altered in some details the courses of de Geer's isobases but have not changed his zero line along the coast west of Newfoundland.

dences which demand, since the Glacial Period, a decided subsidence outside that line.

If we now examine the lists of characteristic plants of Class III, the Southwestern plants which, it seems to me, must have crossed from southern New England to Newfoundland on this bridge, we shall see that they are all species typical of our more purely silicious plains, sterile hills, or acid bogs, but not of the better mixed soils such as the glacial till; many of them being plants which in New Jersey are today abundant only on the Cretaceous and Tertiary clays, sands and gravels and which farther south are almost confined to the Coastal Plain and similar areas.[1] If, on the other hand, we examine the list of characteristic Canadian plants which, though abundant on the west side of the Gulf of St. Lawrence, are unknown in Newfoundland, we shall see that they are chiefly species of rich woods, meadows or other well mixed soils, or highly calcareous ledges and gravels.

When, therefore, we consider the fact that the bridge formed by the elevated coastal plain was composed of silicious soils presumably identical with those found upon the southern Coastal Plain of our present continent it is evident that an ideal route was laid out for the spread northeastward of the plants which prosper chiefly in such soils and it is easy to picture the Red Pine, *Pinus resinosa*, accompanied or soon followed by *Schizaea pusilla*, *Corema Conradii*, *Hudsonia ericoides*, and the other southwestern plants of highly silicious regions, pushing successfully across the bridge to Newfoundland, while *Sabatia dodecandra* got as far as Sable Island and *Ilex glabra* reached the sandy swamps of Nova Scotia. Here too, in the boggy meadows and about the shallow pools, would be a habitat over which the vole and the musk-rat would rapidly spread. But such a very silicious region would have been highly unattractive to *Adiantum pedatum*, *Thuja occidentalis*, *Carex retrorsa*, *Lilium canadense*, *Calypso bulbosa*, *Anemone riparia*, *Dalibarda repens*, *Lonicera canadensis*, *Viburnum alnifolium*, *Solidago squarrosa*, *Aster macrophyllus*, and the hundreds of other plants of richer soils, which not only in eastern Canada but farther south (when they occur there) scrupulously avoid the more sterile areas; and even if they did occasionally straggle slightly off the richer soils

[1] Compare, for example, Britton, Bull. Torr. Bot. Cl. vii. 81 (1880) and Cat. Pl. N. J. (1889); Hollick, Trans. N. Y. Acad. Sci. xii. 191, etc. (1893) and Am. Nat. xxxiii. 1–14, 109–116 (1899); R. M. Harper, Rhodora, vii. 69 (1905), viii. 27 (1906).

in which they delight, these plants would have found the long belt of pine barren region of the bridge as forbidding to them then as are such habitats today. Similarly, though the caribou, Arctic hare, ptarmigan and other boreal animals of Newfoundland, would find the bridge congenial territory, the moose, porcupine, and other mammals of the Canadian forest would find little inducement to leave the denser woods to wander far upon the sand-bridge, and for this reason apparently they failed to accompany the vole and the muskrat (as well as the caribou, etc.) to Newfoundland.

To summarize briefly, the indigenous flora of Newfoundland consists primarily of plants which occur to the north, in Labrador, or to the southwest, chiefly along the Atlantic seaboard or the Coastal Plain; the typical Canadian plants, unless their northeastern range extends to the north side of the Straits of Belle Isle, being essentially absent from the island. The distance between Newfoundland and Labrador is not sufficiently great to prevent ready interchange of species across the Straits of Belle Isle, but the distance between Newfoundland and Cape Breton is so great that the plants of the latter region rarely if ever span it. Birds, ocean-currents, drifting logs and ice, and winds prove to be ineffective in carrying to Newfoundland the plants from the southwest, so that an ancient land-bridge is suggested. This is the more demanded from the presence in Newfoundland of a vole and a muskrat, mammals closely related to species of our coastal region. The amount of water withdrawn from the ocean to form the Pleistocene glaciers was apparently sufficient to leave exposed nearly if not all the old coastal plain which now forms the submerged bench off our coast, and in addition there is unquestioned evidence that since the Glacial Period this coastal bench has been much higher than it is now; so that upon this now submerged plain, as the ice-front receded northward, the southwestern plants, most of which still occur on Cape Cod, Long Island or in the Pine Barrens of New Jersey, must have spread to Newfoundland, where now they form an isolated flora.

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By Sidney F. Blake.

Presented by B. L. Robinson 14 May, 1913. Received 12 June, 1913.

I. A REDISPOSITION OF THE SPECIES HERETOFORE REFERRED TO LEPTOSYNE.

Among the numerous genera of the Helianthoid *Compositae* scarcely any has had a more involved history than the genus *Coreopsis* L., its synonymy embracing more than a score of generic names. On the one hand closely allied to the still larger genus *Bidens*, and perhaps not clearly separable from it, it is related on the other to various smaller and much more distinct genera. One group of about a dozen species, characterized by fertile rays and the presence of an annulus on the tube of the disk-flowers, has by many authors been kept distinct under the name *Leptosyne* DC., but by Bentham and Hooker,[1] Hoffmann,[2] and more recently by Hall,[3] has been reduced to *Coreopsis*, apparently with justice. In habit, involucre, and achenes its members are closely similar to various species of genuine *Coreopsis;* and while most of the species have a thickened hairy annulus at base of throat in the disk-corollas, this is glabrous in some species [4] and entirely absent in others,[5] while the rays although usually fertile are sometimes sterile or neutral in the section *Pugiopappus;* so that in the absence of any quite constant diagnostic character and because of the general very close similarity, it seems advisable to follow the authorities above mentioned in referring the genus definitely to *Coreopsis*.

The genus *Corcocarpus* Bentham, on the other hand, although made a section of *Leptosyne* by Gray and included by Hoffmann in his section *Leptosyne* of *Coreopsis*, departs in its isomorphic involucral scales so

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1 Gen. Pl. ii. 385 (1873).
2 In Engler & Prantl, Nat. Pfl. iv. Ab. 5. 243 (1890).
3 Univ. Calif. Pub. Bot. iii. 139 (1907).
4 *L. maritima*, *L. gigantea*.
5 *L. mexicana*, *L. insularis;* and *Electra* has no annulus.

strikingly from the distinct dimorphism of the bracts, running with considerable uniformity through the whole *Coreopsis* series, as to deserve generic rank. The bracts are imbricated in two rows, subequal and all similar, subherbaceous, and ovate, which in connection with the cymosely panicled small heads makes the genus easy of recognition.

A scapose Mexican perennial, *Leptosyne pinnata* Robinson, described from material without ripe fruit and referred to this genus with considerable doubt, proves to confirm in achenial characters the distinctness already suggested by habit and is described further on as a new genus.

The relation of the groups in question would seem to be best shown thus:

COREOPSIS L. (κόρις bug, and ὄψις likeness, from the form of the achene in the original species, *C. lanceolata* L.) Heads radiate or rarely and abnormally discoid, the flowers all yellow; rays neutral or styliferous and fertile or rarely sterile, disk-flowers mostly fertile. *Involucre double, scales of each series slightly connate at base; the inner membranaceous, 1–2-rowed, brown or yellow; the outer narrower (except in C. calliopisidea), herbaceous, usually shorter than the inner.* Receptacle flat or nearly so; pales flat, membranaceous. Ray-florets ligulate, entire or 2–3-dentate; disk-florets regular, tubular, with slightly enlarged throat and (4–)5-toothed limb, often with a thickened glabrous or pilose ring at base of throat. Anthers entire or barely bidentate at base. Style-tips truncate or with short subulate hispid appendages. Achenes obcompressed, sometimes meniscoid and much thickened on one face, orbicular to oblong, those of the ray when fertile commonly broader than the others, glabrous or pubescent, sometimes villous on the margins, wingless or with a chartaceous wing sometimes pectinately lobed, epappose or with two teeth, short ciliate scales, or glabrous or upwardly hispidulous awns or scales, or with a small cupule in place of pappus.— Herbs or rarely shrubs, glabrous or pubescent. Leaves alternate or usually opposite, undivided and entire or toothed, or ternate, or usually ternately or pinnately dissected. Heads of medium size, solitary or corymbose-panicled.— Gen. 263, no. 670 (1737), and Sp. Pl. ii. 907 (1753), in part.

Subgenus **Leptosyne** (DC.) Blake, n. comb. Rays styliferous, mostly fertile, rarely neutral in the section *Pugiopappus;* disk-flowers usually with a thickened and generally hairy annulus at base of throat. — *Leptosyne* DC. Prod. v. 531 (1836); Gray, Proc. Am. Acad. xvii. 218 (1882), Syn. Fl. i. pt. 2. 299 (1884). *Coreopsis* sect. *Leptosyne*

O. Hoffm. in Engler & Prantl, Nat. Pfl. iv. Ab. 5. 243 (1890) (excluding *Epilepis*, *Coreocarpus*, and *Acoma*).— Twelve species, ranging from California to Guatemala, chiefly Mexican.

Sect. 1. **Electra** (DC.) Blake, n. comb. Suffruticose, with opposite oval to lanceolate coriaceous sometimes ternately parted leaves. Heads solitary or paniculate-corymbose, radiate. Outer involucral scales about 5, oblong; inner about 8, longer, oval-oblong. Rays about 5, 2–3-dentate, oblong to elliptic, fertile, the tube pubescent; disk-flowers with pubescent tube shorter than the cylindric-funnelform throat, and (4–)5-toothed limb; annulus none. Style-branches with subulate hispid appendages. Achenes strongly obcompressed, glabrous, margined, the outer broad, the inner much narrower, all pappusless or the inner rarely with a pair of smooth slender awns.— *Electra* DC. Prod. v. 630 (1836); Gray, Pl. Wright. i. 110, footnote (1852).— Three species of Mexico and Central America.

* Heads numerous in ternate corymbose panicles.

1. C. MEXICANA (DC.) Hemsl. Shrubby, nearly glabrous, 0.6–2 m. high; leaves lanceolate to lance-ovate, acute to acuminate at both ends, sharply serrate, often trifoliately cut nearly to the midrib, glabrate on both sides or retaining a sparse pubescence chiefly along the veins, the blades 4–11 cm. long, on narrowly margined petioles 1–2.5 cm. long; heads 1–1.3 cm. high, 2.5–4 cm. in diameter including rays; achenes 6–9 mm. long.— Biol. Centr.-Am. Bot. ii. 196 (1881). *Electra mexicana* DC. l. c. *Electra Galeottii* Gray, l. c. *Coreopsis Galeottii* Hemsl. l. c. 195.— In an authentic example of *E. mexicana* in the Gray Herbarium, collected by Mendez, the tube of the ray is distinctly hirtellous, and the narrowly lanceolate leaves still show a slight appressed pubescence beneath, while one of the younger heads is also sparingly hairy at the base, so that the characters relied upon by Dr. Gray in separating *E. Galeottii* entirely fail to hold. *Galeotti* 2086, represented by a fragment in the Gray Herbarium, as well as the Baites specimens cited in the original description, is practically glabrous, while *Galeotti* 2087 somewhat approaches the next form.

GUANAJUATO: "circa Villalpando ultra Guanaxuato," *Mendez* (COTYPE in Gray Herb.); Guanajuato, 1895, *Dugès* 472; near Cadereyta, 22 Aug. 1905, *Rose* 9717; HIDALGO: sunny rocky slopes, Pachuca, Sept. 1905, *Purpus* 1550; clay banks, Dublan, alt. 2070 m., 15 Oct. 1902, *Pringle* 9895; Sierra de Pachuca, 2900 m., 14 Sept. 1899, *Pringle* 8218; near Metepic Station, 2530 m., 20 Sept. 1904, *Pringle* 13041; MEXICO: barranca above Santa Fe, 2600 m., 1 Sept.

1905, *Pringle* 13547; Oaxaca: Cerro San Antonio, 1650 m., 26 June 1906, *Conzatti* 1431; Chiapas: 1864–1870, *Ghiesbreght* 133, 539 (both with panicle and under side of leaves along veins loosely pubescent); Mexico without locality: 1864, *Baites; Galeotti* 2086, 2087 (types of *E. Galeottii* Gray, in Gray Herb.). Guatemala: Dept. Alta Verapaz, Dec. 1907, *Türckheim* II 2043 (large-leaved); Dept. Amatitlan, near Amatitlan, 20 July 1860, *Sutton Hayes;* Dept. Jalapa, Laguna de Ayarza, Sept. 1892, *Heyde & Lux* 3792.

1β. C. mexicana (DC.) Hemsl. var. **hyperdasya** Blake, n. var., foliis infra ubique dense pubescentibus, supra venis exceptis glabratis vel scabriusculis, caulibus et gemmis et inflorescentia fuscis cum pilis tomentosis lente subglabratis.— Oaxaca: ravines of hills near Oaxaca, 1830 m., Sept. 1894, *Pringle* 4896 (type sheet in Gray Herb.); La Carbonera, 2165 m., 20 Sept. 1895, *L. C. Smith* 808; Cerro de San Felipe, 2000 m., 1 Sept. 1897, *Conzatti & González* 545, 546; San Juan del Estado, 18 June 1894, *L. C. Smith* 25; near Reyes, 1830–2290 m., 17 Oct. 1894, *Nelson* 1718 (approaching the next form); Hidalgo: Mineral del Monte, *C. Ehrenberg* 354.

1γ. C. mexicana (DC.) Hemsl. var. hyperdasya Blake f. **holotricha** Blake, n. forma, foliis parvis utrimque cineraceis pube densa subscabra.— Puebla: vicinity of San Luis Tultitlanapa, July 1908, *Purpus* 3099 (type sheet in Gray Herb.).

* * Heads long-peduncled, solitary or rarely somewhat panicled.

+ Leaves 2–5 cm. long, cuneately oblanceolate or obovate; disk-corollas 5-toothed.

2. C. cuneifolia Greenm. Suffruticose, trichotomously branched, the young growth pubescent, later glabrate; leaves pale green especially beneath, with a few loose hairs when young, mucronately 5–11-toothed above the middle, tapering to a sessile margined base; heads 8–10 mm. high, 2 cm. across the rays.— Proc. Am. Acad. xl. 43 (1904). — Jalisco: dry rocky mountains above Etzatlan, 2 Oct. 1903, *Pringle* 8781; Sierra de San Estaban, near Guadalajara, 1830 m., 21 Oct. 1903, *Pringle* 11900; Durango: 16 Aug. 1897, *Rose* 2344.

+ + Leaves 1–2 cm. long, oval; disk-corollas 4-toothed.

3. C. **parvifolia** Blake, n. sp., fruticosa trichotome ramosa juventate appresse pubescens denique glabrata cortice cano; foliis parvis 1–2 cm. longis ovalibus supra appresse pubescentibus infra paullum crinitis vel glabratis supra partem inferiorem integram utroque ca. 5-mucronato-dentatis, summis imminutis subintegris; pedunculis solitariis ramos terminantibus 3–6.5 cm. longis subpubescentibus;

capitulis 1–1.5 cm. altis 3 cm. diametro (radiis inclusis); squamis exterioribus subcrinitis oblongo-spatulatis obtusis, interioribus oblongis obtusis apice fimbriatis (8–10 mm. longis 4–5 mm. latis); radiis ca. 5 ovalibus 13 mm. longis 8 mm. latis; corollis disci 7 mm. longis infra hirtellis 4-dentatis.— PUEBLA: dry rocky hillsides, Esperanza, Aug. 1907, *Purpus* 2581 (TYPE in Gray Herb.).

Sect. 2. **Anathysana** Blake, n. sect., herbae perennes caulibus pluribus radice lignea foliis oppositis integris vel pinnatiformibus lobis paucis filiformi-linearibus. Involucrum ut apud §1, squamis interioribus 8–12. Flosculi radii fertiles; ei disci saepius exannulati. Styli rami apice incrassati breviter appendiculati. Achenia ut apud §1, epapposa.— Type species *Leptosyne mexicana* Gray (= *C. cyclocarpa* Blake).— Three species of Mexico and Socorro Island.

*** Leaves entire, linear-filiform.**

4. C. **cyclocarpa** Blake, n. nom. Stems numerous from a thick woody base, 6–7 dm. high, slightly pubescent below; leaves 2–6 cm. long, entire or very rarely 3-lobed from near the middle, ciliate at base; heads rather few, long-peduncled, 6–8 mm. high, 1.5–2.5 cm. in diameter including the 8–10 rays; outer scales about half as long as inner; disk-florets exannulate.— *Leptosyne mexicana* Gray, in Wats. Proc. Am. Acad. xxii. 429 (1887), not *C. mexicana* (DC.) Hemsl. (1881).— Named from the orbicular indistinctly margined achenes, those of the ray 4.5 by 4.5 mm.— JALISCO: Rio Blanco, Sept. 1886, *Palmer* 568 (TYPE of *L. mexicana* in Gray Herb.); near Guadalajara, 10 Sept. 1890, *Pringle* 3570, 24 Sept. 1891, *Pringle* 3841, 4 Oct. 1903, *Pringle* 11546.

*** * Leaves pinnately divided into 3–7 linear lobes, the uppermost sometimes entire.**

+ Heads larger, inner involucre 6–8 mm. long; leaves mostly with 3 lateral pairs of lobes; disk-flowers with hairy annulus.

5. C. **pinnatisecta** Blake, n. nom. In habit, pubescence, and involucre very similar to the last; leaves 2–3 cm. long, the lobes mucronate-tipped; achenes obovate, 3.5–4 mm. long, 2.5 mm. broad.— *Leptosyne Pringlei* Rob. & Greenm. Am. Journ. Sci. ser. 3. l. 155 (1895), not *C. Pringlei* Rob. Proc. Am. Acad. xliii. 41(1907).— OAXACA: Sierra de San Felipe, 2135 m., 7 Aug. 1894, *Pringle* 4871 (TYPE in Gray Herb.); PUEBLA: Cerro de Paxtle, near San Luis Tultitlanapa, Sept. 1909, *Purpus* 4098.

+ + Heads smaller, inner scales 4–5 mm. long; leaves mostly with 1 pair of lobes; disk-flowers exannulate.

6. C. **insularis** (Brandeg.) Blake, n. comb. Decumbent (base unknown), nearly glabrous; leaves 1–2.5 cm. long, 3–5-lobed; heads axillary and terminal, about 1.3 cm. in diameter including the small rays; outer bracts $\frac{2}{3}$ as long as inner; achene 4.2 mm. long.— *Leptosyne insularis* Brandeg. Erythea vii. 5 (1899).— Socorro Island: March–June 1897, *Anthony* 394 (type collection): 27 May–3 July 1903, *F. E. Barkelew* 223.

Sect. 3. **Tuckermannia** (Nutt.) Blake, n. comb. Stout perennials, with alternate fleshy 2–3-pinnately dissected leaves and large heads. Outer involucral scales 5–8, lance-oblong, about equaling the inner; the latter about 12, oblong. Rays large, fertile. Disk-flowers with nearly glabrous annulus. Achenes obcompressed, glabrous, narrowly winged, epappose or rarely with margins produced into short teeth or awns.— *Tuckermannia* Nutt. Trans. Am. Philos. Soc. ser. 2. vii. 363 (1841). *Leptosyne* sect. *Tuckermannia* Gray, Bot. Calif. i. 356 (1876), & Syn. Fl. i. pt. 2. 300 (1884).— Two species of California, Lower California, and adjacent islands.

* Heads few, on very long naked peduncles, 6–8 cm. broad including rays.

7. C. maritima (Nutt.) Hook. fil. Stems fleshy-herbaceous, spreading, 3–8 dm. high, from a thick woody base; leaf-lobes linear, 1.5–3 mm. broad; peduncles 2–5 dm. long; rays 14–20; achenes rarely with 2 teeth or awns.— Bot. Mag. t. 6241 (1876). *Tuckermannia maritima* Nutt. l. c. *Leptosyne maritima* Gray, Proc. Am. Acad. vii. 358 (1868).— Coast of San Diego County, California, northern Lower California, and adjacent islands.

* * Heads numerous, cymosely clustered toward tips of branches on peduncles mostly 1–1.5 dm. long, smaller (5–6 cm. broad).

8. C. gigantea (Kellogg) Hall. Stems fleshy-woody, erect, 3–30 dm. high, often 1 dm. thick; leaves mostly clustered toward tips of branches; leaf-lobes finer, 1–1.5 mm. broad; rays 10–16; pappus none.— Univ. Calif. Pub. Bot. iii. 142 (1907). *Leptosyne gigantea* Kell. Proc. Calif. Acad. iv. 198 (1872).— Coast of southern California and islands, from Los Angeles County to San Luis Obispo County; also Guadalupe Island, Lower California.— A form occurs on San Nicolas Island (*Blanche Trask* 76, in part) with discoid heads, the receptacle very chaffy, the disk-florets showing dialysis of corolla with more or less complete abortion of sexual organs.

Sect. 4. **Pugiopappus** (Gray) Blake, n. comb. Annuals, branched

from the base, with 2–3-pinnatifid leaves mostly basal, and medium-sized heads solitary on long nearly naked peduncles. Outer involucral scales 5–7; inner about 8. Rays usually styliferous and fertile, sometimes neutral or with short included styles, broad and many-nerved. Disk-flowers with bearded ring. Achenes dimorphous: those of ray epappose, corky-margined and more or less corky-ridged on the faces; those of disk long-villous on margins, bearing a pair of linear-lanceolate denticulate paleae.— *Agarista* DC. Prod. v. 569 (1836), not D. Don 1834 (*Ericaceae*). *Pugiopappus* Gray, Pacif. R. Rep. iv. 104 (1857). *Leptosyne* sect. *Pugiopappus* Gray, Syn. Fl. l. c.— Two species of southern California.

* Outer scales linear-lanceolate.

9. C. BIGELOVII (Gray) Hall. Simple or branched below, 1–6 dm. high; leaves 5–10 cm. long, or smaller in starved specimens; outer scales 6–11 mm. long, the inner ovate, 8–12 mm. long; rays 1–2 cm. long; disk-achenes black, 6 mm. long, glabrous on both faces or slightly pubescent on inner, twice as long as the awns.— Univ. Calif. Pub. Bot. iii. 141 (1907). *Pugiopappus Bigelovii* Gray, Pacif. R. Rep. l. c. *Leptosyne Bigelovii* Gray, Syn. Fl. l. c. *P. Breweri* Gray, Proc. Am. Acad. viii. 660 (1873). *L. hamiltonii* Elmer, Bot. Gaz. xli. 323 (1906).— Southern California, not on the coast, from Tulare County to the Colorado Desert.— The annulus of the disk-flowers, in the types and other specimens examined, is very distinctly bearded, not glabrous as originally described and as repeated in the Synoptic Flora and by Hall.

* * Outer scales deltoid-ovate.

10. C. CALLIOPSIDEA (DC.) Gray. Rather stouter and more leafy-stemmed, with broader leaf-lobes; outer scales united for about half their length, the free deltoid tips 5–6 mm. long; inner scales 11–14 mm. long; rays 1–2.5 cm. long; disk-achenes villous on inner face, nearly equaled by their pappus.— Bot. Mex. Bound. 90 (1859). *Agarista calliopsidea* DC. Prod. v. 569 (1836). *Leptosyne calliopsidea* Gray, Syn. Fl. l. c. *L. calliopsidea* var. *nana* Gray, l. c. (a dwarfed form). *Pugiopappus calliopsidea* Gray, Proc. Am. Acad. viii. 660 (1873). *P. calliopsideus* Gray, Bot. Calif. i. 355 (1876).— Southern California, from Cholame (San Luis Obispo County) to Santa Barbara County and the Mohave Desert; north to middle California according to Hall.

Sect. 5. **Euleptosyne** (Gray) Blake, n. comb. Similar to last section in habit and involucre (outer scales linear); rays glabrous, fertile. Disk-flowers with an annulus, nearly glabrous in one species. Style-

branches enlarged at tip, short-appendaged. Achenes corky-winged, sometimes meniscoid, with a cupule in place of pappus.— *Leptosyne* sect. *Euleptosyne* Gray, Syn. Fl. i. pt. 2. 299 (1884).— Two species of Arizona, California, and northern Lower California.

* Achenes with numerous clavellate hairs on both faces; disk-corollas with bearded annulus; leaf-divisions nearly filiform.

11. C. Douglasii (DC.) Hall. Scapes solitary or few, 1–3.5 dm. high; leaves chiefly in a dense basal tuft, entire or mostly 1–2-pinnately dissected into linear-filiform lobes, 2–10 cm. long; outer involucral scales linear, 5–8 mm. long; inner yellow, scarious-margined, multinervose, ovate, slightly longer.— Univ. Calif. Pub. Bot. iii. 140 (1907). *Leptosyne Douglasii* DC. Prod. v. 531 (1836). *L. californica* Nutt. Trans. Am. Philos. Soc. ser. 2. vii. 363 (1841). *L. Newberryi* Gray, Proc. Am. Acad. vii. 358 (1868).— Southern California and southern Arizona; also San Quentin, Lower California, 1889, *Palmer* 677.

* * Achenes without clavellate hairs, glabrous on outer face, more or less papillose on inner; annulus nearly or quite glabrous; leaf-divisions about 1–1.5 mm. broad.

12. C. **Stillmanii** (Gray) Blake, n. comb. Somewhat stouter than last, more leafy below; corky margin of achene rugose.— *Leptosyne Stillmanii* Gray, in E. Durand, Journ. Acad. Nat. Sci. Phila. iii. 91 (1855), and in Torr. Bot. Mex. Bound. 92 (1859). *L. Stillmani* Gray, Bot. Calif. i. 356 (1876).— California: Calaveras Co., *Heermann;* valley of the Sacramento, *Stillman* (type in Gray Herb.); hillsides, Auburn, April 1865, *Bolander* 4520; dry sand hills, Antioch, 16 April 1868–9, *Kellogg & Harford* 439; fields, Middle Tule River, 240–305 m., April–Sept. 1897, *Purpus* 5004.

COREOCARPUS Benth. (κόρις bug, and καρπός fruit, from the peculiar achenes). Heads heterogamous, radiate, the flowers all yellow; rays styliferous, fertile, disk-flowers mostly fertile. Involucral scales 5–8, 2-rowed, subequal, submembranaceous, dark-lineate, ovate to ovate-oblong, the outer obtusish, the inner acuminate; heads sometimes with a few bractlets at base. Receptacle flat, with narrow membranaceous pales subtending the flowers. Ligules small, 4–5-nerved, entire or emarginate; disk-corollas regular, tubular, with slightly enlarged funnelform throat and 5-toothed limb, with a hairy annulus at base of throat. Style-branches with subulate hispid appendages. Anthers entire at base. Achenes obcompressed, with an

entire or pectinately cut crustaceous wing, calvous or with two retrorsely hispidulous slender awns, often granular on one or both faces. — Annuals or suffrutescent perennials, with opposite 1–2-pinnately divided leaves, and small slender-peduncled heads (less than 2 cm. in diameter including the rays) in somewhat ternate cymose clusters at the ends of the branches.— Bot. Voy. Sulph. 28, t. 16 (1844); Gray, Proc. Am. Acad. v. 162 (1861). *Acoma* Benth. l. c. 29, t. 17 (1844). *Leptosyne* sect. *Coreocarpus* Gray, Syn. Fl. i. pt. 2. 301 (1884).— Three species of the Sonoran region.— Well distinguished by inflorescence, and by the involucre of few similar scales, not double as in all members of the genus *Coreopsis*.

* Herbaceous annuals.

1. C. PARTHENIOIDES Benth. Slender, 2–4 dm. high, branched above, nearly glabrous, bearing few heads in somewhat ternate terminal clusters; leaf-blades 2–4.5 cm. long on petioles nearly as long, somewhat thickish, bipinnatifid, the primary lobes deltoid, 1–2 cm. long, nearly as broad, entire or 3–4-lobed with broad divisions; heads 5–6.5 mm. high, about 1 cm. broad including the rays; rays oval, about 5, 5 mm. long, yellow, often drying whitish with purplish veins; achenes oblong, crenate-margined, in the only specimens examined; figured by Bentham as oval, shortly 2-awned, with imperfectly dissected wing.— Bot. Voy. Sulph. 28, t. 16 (1844). *Leptosyne parthenioides* Gray, l. c.— Bentham's type came from Bay of Magdalena, Lower California. The only specimens examined are: SONORA: high in the mountains, Guaymas, Oct. 1887, *Palmer* 299.

1β. C. PARTHENIOIDES Benth. var. **heterocarpus** (Gray) Blake, n. comb. Leaves bi-tripinnatifid with finer divisions, the ultimate ones nearly linear; margin of achenes entire and incurved or dissected into lobes; awns sometimes present.— *Coreocarpus heterocarpus* Gray, Proc. Am. Acad. v. 162 (1861). *Leptosyne heterocarpa* Gray, Syn. Fl. l. c. *L. dissecta* Gray, l. c. (as to plant, not synonym). *L. parthenioides* var. *dissecta* Wats. Proc. Am. Acad. xxiv. 56 (1889), as to plant cited, not as to name-bringing synonym. *Coreocarpus involutus* Greene, Pittonia, i. 290 (1889).— While *C. heterocarpus* Gray appears to be merely a form of *C. parthenioides*, as long ago suggested by Dr. Watson, indistinguishable by achenial characters alone, it nevertheless differs sufficiently in foliar characters to retain varietal rank. *C. involutus* Greene, of which no authentic specimen has been seen, is judging from the description inseparable from this variety. Plants collected by Brandegee on Natividad Island and distributed as this

species are slightly stouter and more pubescent than any other specimens examined but show no essential differences.— LOWER CALIFORNIA: Lagoon Head, Mar. 1889, *Palmer* 795; Natividad Island, 10 April 1897, *Brandegee;* Cape San Lucas, &c., Aug. 1859–Jan. 1860, *Xantus* 62 (TYPE of *C. heterocarpus*); San José del Cabo, 8 Mar. 1892, *Brandegee* 339; La Paz, 20 Jan.–5 Feb. 1890, *Palmer* 19; Santa Agueda, 4–6 Mar. 1890, *Palmer* 248; mountain sides, Los Angeles Bay, Dec. 1887, *Palmer* 660; Lower California, without locality, *Dr. Street.*

* * Suffrutescent perennials.

+– Achene-wing pectinately dissected.

2. C. **arizonicus** (Gray) Blake, n. comb. Much branched from a woody base, nearly or quite glabrous; leaves 7–10.5 cm. long, pinnately divided into 3–5 linear lobes 1–3 mm. wide; heads rather numerous in panicled few-headed cymes; involucral scales 5–6 mm. long; rays 5–6, 7 mm. long; achenes with the wing split into flattened cuneate lobes, the inner achenes narrower; retrorsely spinulose awns sometimes present.— *Leptosyne* (*Coreocarpus*) *arizonica* Gray, Proc. Am. Acad. xvii. 218 (1882). *Coreopsis arizonica* O. Hoffm. in Engler & Prantl, Nat. Pfl. iv. Ab. 5. 243 (1890).— ARIZONA: along streams, Ft. Lowell, Aug. 1880, *Lemmon* (COTYPE); by streams of the Santa Catalina Mts., 760–1060 m., April 1881, *Pringle* (COTYPE); Santa Catalina Mts., May 1881, *Lemmon* 211; mountains, Lowell, 8 May 1884, *W. F. Parish* 112. SONORA: Touibabi, 18 Nov. 1890, *F. E. Lloyd* 407; Alamos, 1890, *Palmer* 384 (approaching the next form); CHIHUAHUA: southwestern part, 1885, *Palmer* 294.

2β. C. ARIZONICUS (Gray) Blake var. **pubescens** (Rob. & Fern.) Blake, n. comb. Whole plant pubescent with short rather soft hairs.— *Leptosyne arizonica* var. *pubescens* Rob. & Fern. Proc. Am. Acad. xxx. 118 (1894).— SONORA: Granados, 905 m., 15 Nov. 1890, *Hartman* 222; Huchuerachi, 1220 m., 5 Dec. 1890, *Hartman* 296; Agnos Blanco, 9 Dec. 1890, *Lloyd* 406.

2γ. C. ARIZONICUS (Gray) Blake var. **filiformis** (Greenm.) Blake, n. comb. Leaf-lobes linear-filiform, less than 1 mm. wide, the lower 4–6 cm. long.— *Leptosyne arizonica* var. *filiformis* Greenm. Proc. Am. Acad. xl. 44 (1904).— SINALOA: Sierra de Choix, 80 km. NE. of Choix, 15 Oct. 1898, *Goldman* 258 (COTYPE in Gray Herb.).

+– +– Achene-wing thick, often rugose, entire or barely crenulate; leaves fleshy, bipinnatifid.

3. C. **dissectus** (Benth.) Blake, n. comb. Suffrutescent, trichotomously branched, glabrous; leaves mostly crowded near the base of

the young branches, 1–2-pinnatifid, 1.5–2.5 cm. long, ternately cut into short fleshy linear lobes, on petioles nearly as long; heads cymosely arranged in nearly naked panicles, as large as those of last species; achenes 4 mm. long, 2.5 mm. broad.— *Acoma dissecta* Benth. Bot. Voy. Sulph. 29, t. 17 (1844). *Leptosyne dissecta* Gray, Syn. Fl. i. pt. 2. 301 (1884), as to synonym. *L. parthenioides* var. *dissecta* Wats. Proc. Am. Acad. xxiv. 56 (1889), as to synonym only.— Bentham's type came from Cape San Lucas. The only specimens examined are three sheets from Magdalena Island, Lower California, collected 12 Jan. 1889 by *Brandegee* (see Brandeg. Proc. Calif. Acad. ser. 2. ii. 176 (1889)).

3β. C. dissectus (Benth.) Blake var. **longilobus** Blake, n. var., foliis 5–7.5 cm. longis pinnatiformibus, segmentis (3–5) lineari-filiformibus, lobis inferioribus 2–3 cm. longis 3–5-lobatis; acheniis ut in forma typica sed margine crenulatis.— Lower California: Carmen Island, 1–7 Nov. 1890, *Palmer* 877 (type sheet in Gray Herb.; distributed as *L. dissecta* Gray).

STEPHANOPHOLIS Blake, n. genus Compositarum Coreopsidearum (*στέφανος* crown, and *φολίς* scale). Capitula heterogama radiata, radiis fertilibus. Involucrum duplex squamis liberis, exterioribus 5–6 herbaceis obtusis ovato-lanceolatis; interioribus circa 8 submembranaceis ellipticis atroviridibus apice rotundatis margine angusto scario fimbriatulo exteriores subaequantibus. Receptaculum conicum, paleis planis membranaceis flavis apice rotundatis. Radii corollae ca. 12 ligulatae oblongae tridentatae supra albidae infra atroplumbeae glabrae obscure ca. 8-nervatae. Disci corollae flavae glabrae exannulatae 5-dentatae tubulo breve. Antherae basi subintegrae apice appendice deltoideo munitae. Styli rami apice incrassati. Achenia dimorpha: ea radii valde obcompressa ovalia glabra epapposa; disci paullo crassiora oblonga supra appresse pubescentia, pappo coroniformi e squamis brevissimis inaequalibus lacerato-fimbriatis vix junctis ad angulos plus minusve exaggeratis composito.— Herbae perennes scaposae pratincolae radicibus fasciculatis caulibus a foliorum basibus fibrillosis persistentibus lanugine brunnea intermixta vestitis. Folia multa longa integra vel pimatiformia. Scapi pauci nudi vel 1–2-bracteati capitula solitaria majuscula radiis albidis gerentes. Genus habitu pappo clinio conico bene distinguitur. Type species *Leptosyne pinnata* Rob.— One species with a variety, in mountain meadows of southern Mexico.

1. S. **pinnata** (Rob.) Blake, n. comb. Smooth except base and scapes; leaves 1–3.5 dm. long, with 3–6 pairs of small oblong lobes and a much enlarged slightly glandular-crenulate terminal one 3.5–9.5 cm. long; scapes very rarely branched, densely appressed-pubescent above, exceeding the leaves; head about 1 cm. high, 3 cm. broad including the rays.— *Leptosyne pinnata* Rob. Proc. Am. Acad. xxvii. 176 (1892). — MEXICO: wet meadows, Del Rio, 30 Aug. 1890, *Pringle* 3668 (TYPE in Gray Herb.); wet meadows, Valley of Toluca, 19 Aug. 1892, *Pringle* 4194; wet alpine meadows, Sierra de las Cruces, 2990 m., 28 Aug. 1904, *Pringle* 13067.

1β. S. PINNATA (Rob.) Blake var. **integrifolia** (Greenm.) Blake, n. comb. Leaves entire, narrowly lanceolate, only very slightly crenulate, 1.5–2 dm. long; pappus slightly more developed.— *Leptosyne pinnata* var. *integrifolia* Greenm. Proc. Am. Acad. xl. 44 (1904).— DURANGO: near El Salto, 12 July 1898, *Nelson* 4580 (COTYPE in Gray Herb.).

II. A REVISION OF ENCELIA AND SOME RELATED GENERA.

In the course of a revision of the genus *Encelia*, as at present understood, it has been found necessary for clearness of definition to remold the group by the reference of a number of species to the related genera *Viguiera*, *Flourensia*, and *Verbesina*, and by the recognition of several genera long treated as synonymous; and in view of the changes in generic boundaries involved it seems desirable to consider briefly the history of some of these related genera and to contrast their characters.

Only two genera of this immediate relationship were known to Linnaeus. *Helianthus*, characterized by its thickish achenes with promptly deciduous pappus of paleaceous awns and sometimes also squamellae (short intermediate scales), is today taken in its original interpretation, save that the small and very distinct genus *Heliopsis* was later erected by Persoon on one of the original species (*H. laevis*). The Linnaean genus *Verbesina*, on the other hand, was very composite, its ten original species (reducible to nine or eight) representing seven modern genera, two only of the species being now included in the genus. It is well distinguished by the generally fertile rays and the chartaceo-cartilaginous wings of the flat achene, but these being usually invisible or indistinct in the ovary young material is easily

misplaced, and several species of *Verbesina* have been described under *Encelia*.

Encelia Adanson[6] was based on "Cotula marit. Peruana," cultivated in the Jardin de Roi at Paris, which is *Encelia canescens* Lam.,[7] an alternate-leaved perennial with epappose achenes villous on the edges and narrowly white-margined. In 1789 L'Héritier[8] redescribed the plant as *Pallasia halimifolia*, a new genus, quoting as a synonym *Coreopsis limensis* Jacq.,[9] but not referring to Adanson's genus. The species was again described and figured by Cavanilles[10] in 1791, Lamarck being correctly accredited with the authorship of the species, which has nevertheless since been universally attributed to Cavanilles.

In 1807 Persoon [11] described the genus *Simsia*, basing it upon three species published by Cavanilles under *Coreopsis*, of which one, *S. ? heterophylla*, has since become the type of *Iostephane* Benth., while the others, both reducible to the species long known as *Simsia auriculata* DC. or *Encelia mexicana* Mart., have always been retained in *Simsia* — characterized mainly by the biaristate not villous-edged achene — until that genus was merged with *Encelia* in 1873.

Both genera were recognized by De Candolle in his Prodromus in 1836, *Encelia* with four species and *Simsia* with eight, several species being here first published, and the new genus *Armania* Bertero [12] was described, based upon *Hopkirkia fruticulosa* Spreng.,[13] a species not since identified but certainly a *Simsia*.

In a communication by Gray to the American Academy, apparently first published [14] in 1847, two new genera of this group were proposed, *Barrattia* Gray & Engelmann for a species closely allied to *Simsia* but with epappose achenes, and *Geraea* Torr. & Gray for an annual with narrowly cuneate villous achenes having well developed margin and crown and two strong awns. Two years later both genera were reduced to *Simsia* by Dr. Gray.[15] In Bentham's treatment twenty-four years later in his Genera Plantarum [16] they were recognized as sections of *Encelia*, to which *Simsia* was here also for the first time definitely subordinated. Dr. Gray, in a paper of 1883 [17] and in the Synoptical Flora, carried the reduction a step further by including

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6 Fam. ii. 128 (1763).
7 Encycl. Meth. ii. 356 (1786).
8 In Ait. Hort. Kew. iii. 498 (1789).
9 Coll. ii. 299 (1788), & Icon. iii. t. 594 (1786–1793).
10 Icon. i. 45. t. 61 (1791).
11 Syn. ii. 478 (1807).
12 Prod. v. 576 (1836).
13 Sys. iii. 444 (1826).
14 Am Journ. Sci. ser. 2. iii. 274–5 (Mar. 1847).
15 Pl. Fendl. 85 (1849).
16 Gen. Pl. ii. 378 (1873).
17 Proc. Am. Acad. xix. 7–9 (1883).

Geraea in the section *Euencelia*, and *Barrattia* in *Simsia*. Since Dr. Gray's treatment nothing has been done in the way of a revision of the group as a whole, nor has any new species been described under any of the genera *Pallasia*, *Armania*, *Geraea*, *Barrattia*, or *Simsia* since 1859.

In 1871 D. C. Eaton [18] described as *Tithonia argophylla* a remarkable new species from Utah, with large solitary heads, squamellaceous corona between the awns of the achene, and densely silvery-pubescent basal leaves, which two years later was referred to *Encelia* by Dr. Gray,[19] who at the same time added a very similar new species (*E. nudicaulis*). Ten years after Gray [20] transferred them to *Helianthella*, instituting for their reception the new section *Enceliopsis*. In 1909 Aven Nelson [21] elevated the group to generic rank, mainly on the basis of habit, enumerating five species, one of them new, which I have not been able to separate from *E. nudicaulis*.

Hemsley [22] in 1881 listed 17 species of *Encelia* from Mexico, describing one new species and making many new combinations of names which had been first published under *Simsia*.

In recent years the boundaries of the genus *Encelia* have been stretched to include a number of shrubby Mexican species, usually described from material without ripe fruit, which in the light of all their characters require transferral to other genera (*Viguiera*, *Flourensia*, *Verbesina*) if generic distinctions in this group are to be preserved. Six species (*E. hypargyrea*, *maculata*, *montana*, *Pringlei*, *rhombifolia*, *squarrosa*), with achenes plumpish when mature, so far as known, and a persistent pappus of two aristate or paleaceous awns and several short truncate squamellae, exactly agree with *Viguiera* in essential characters and are further on transferred to that genus. Another fascicle of six species (*E. collodes*, *glutinosa*, *microphylla*, *oblonga*, *resinosa*, *suffrutescens*) is not so easily placed owing to lack of ripe fruit in nearly every species, but all differ in more or less essential characters from the true genus *Encelia*, and may by a slight extension of character be included in *Flourensia* DC.[23] This genus, wrongly referred by Bentham [24] to *Helianthus*, was based on four species, two radiate Chilean plants and two discoid Mexican species, the latter taken by Gray [25] as typical of the genus. One of the Chilean species,

18 In Wats. Bot. King's Rep. v. 423 (1871).
19 Proc. Am. Acad. viii. 657 (1873).
20 Proc. Am. Acad. xix. 9 (1883).
21 Bot. Gaz. xlvii. 432 (1909).
22 Biol. Centr.-Am. Bot. ii. 183–5 (1881).
23 Prod. v. 592 (1836).
24 Gen. Pl. ii. 376 (1873).
25 Proc. Am. Acad. xix. 7 (1883).

F. corymbosa DC., is a true *Viguiera* and was transferred to that genus by Gray in 1883 under the new name *V. Poeppigii*, the name *corymbosa* being rejected as inappropriate; but Reiche [26] says: "El estremo de los tallos corimboso-ramoso, rara vez indiviso. Cabezuelas terminales en las ramas hácia arriba desnudas"; and in any case the name *corymbosa*, not being preoccupied, must be retained.[27] The remaining three species, alternate-leaved glutinous shrubs with villous achenes noticeably thicker than in true *Encelia*, and with a pappus of two slender awns disposed to be trifid from near the base, with or without slender acute squamellae, form a rather definite group which has since been increased to about ten species. Of the six Encelias above mentioned four (*E. collodes*, *microphylla*,[28] *oblonga*, *suffrutescens*) agree well with these characters, except that *E. oblonga* and *E. suffrutescens* are scarcely glutinous, while the remaining two species, fully mature fruit of which is greatly to be desired, in their general characters are so close to the others as to justify their allocation here.

The genera *Encelia*, *Geraea*, and *Simsia* are here separated mainly on the strength of characters to which attention has not previously been directed. The fourteen species included in *Encelia* are all perennials with leaves all alternate, achenes very flat, villous at least on margins, narrowly white-bordered and generally pappusless, bluntish short-hairy style-branches, and receptacular chaff softly scarious, bluntish, falling with the achenes. The two species included in *Geraea* are annuals or biennials, with all or nearly all the leaves alternate, pales as in the last, longer and more hairy style-branches, and narrowly cuneate villous achenes with strong white border, awns, and conspicuous crown, the last represented on the ovary in at least one species by a squamellaceous corona. The twenty-two species included in *Simsia* are mostly annuals, with always some at least of the lower leaves opposite, marginless thin-edged not villous achenes, attentuate hispid style-branches, and stiff acuminate pales persistent long after the achenes have fallen. The characters of these and some related genera are contrasted in the following key.

In the course of this revision some 670 sheets have been studied, representing all the material in the Field Columbian Museum, the

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[26] Fl. Chile, iv. 93 (1905).

[27] VIGUIERA **corymbosa** (DC.) Blake, n. comb. *Flourensia corymbosa* DC. Prod. v. 592 (1836); Reiche l. c. (q. v. for vars.). *Helianthus corymbosus* Poeppig in DC. l. c. as syn. *H. revolutus* Meyen "Reise i. 311 (1843)." *Viguiera Poeppigii* Gray, Proc. Am. Acad. xix. 6 (1883).

[28] The close resemblance of *E. microphylla* to *Flourensia* was commented on by Dr. Gray (Proc. Am. Acad. xix. 7, and Syn. Fl.).

National Herbarium, and the Gray Herbarium. I wish to thank Mr. W. R. Maxon and Dr. C. F. Millspaugh for the loan of the material of *Encelia* under their charge, Mr. M. E. Jones for the loan of 11 sheets of *Enceliopsis* and for assistance in other ways, M. Casimir de Candolle for a photograph of the type of *Simsia lagascaeformis* and critical notes, and Dr. Philip Dowell for aid in proof-reading. I am greatly indebted to Miss Mary A. Day of the Gray Herbarium for assistance in proof-reading and for constant help in bibliographical matters, and above all to Dr. B. L. Robinson for his advice and guidance throughout the whole course of my work.

Key to Encelia and some related Genera.

Achenes very flat; no squamellae except in *Helianthella* and *Enceliopsis*.
  Achenes winged; rays usually fertile.....Verbesina L.
  Achenes wingless; rays neutral.
    Squamellae present.
      Usually leafy-stemmed herbs of mountainous regions, with green leaves and frequently foliaceous outer involucral bracts; squamellae mostly narrow, laciniate, and united at base; achenes not villous or white-margined. Helianthella T. & G.
      Scapose desert plants with canescent or silvery broadly oval or rhombic leaves; outer scales never foliaceous; squamellae short and indistinct, mostly united into a low sometimes entire crown; achene villous except in *E. grandiflora*, and strongly white-bordered.....Enceliopsis (Gray) A. Nels. (p. 351.)
No squamellae.
  Scapose, with broad leaves and large solitary heads..(Enceliopsis)
  Leafy-stemmed (except *E. scaposa*, which has linear leaves); heads several (except in two species with linear leaves), small or medium-sized.
    Pales soft, bluntish, falling with the achenes; leaves alternate; achenes villous at least on margins.
      Perennials; style-branches bluntish, not villous; achenes without crown, usually epappose.
        Encelia Adans. (p. 358.)
      Annuals or biennials; style-branches longer, villous; achene narrowly cuneate, with strong white margin, awns, and crown.....Geraea T. & G. (p. 355.)
    Pales rigid, acute or acuminate, persistent; lower leaves opposite; style-branches attenuate, hispid-villous; achenes not villous-ciliate.....Simsia Pers. (p. 376.)
Achenes thickened; squamellae often present.
  Pappus caducous, of paleaceous awns and rarely short squamellae; herbs.
    Helianthus L.
  Pappus more persistent [29]; awns often aristate, squamellae usually present; herbs or shrubs.
    Squamellae none, or narrow and acute; achenes usually densely villous; alternate-leaved usually glutinous shrubs.....Flourensia DC.
    Squamellae present, mostly short, rounded, fimbriate; herbaceous or frutescent, very rarely resiniferous, often opposite-leaved.
      Viguiera HBK.

[29] Caducous in some Viguieras, e. g. *V. Mandoni* Sch. Bip.

Herbs, with alternate linear leaves and four-angled achenes, or scapose, with linear-lanceolate leaves ..... (HELIANTHELLA)

ENCELIOPSIS (Gray) A. Nels. (*Encelia*, and ὄψις likeness).— Heads large, many-flowered, radiate or discoid, the rays neutral; flowers all yellow. Involucre hemispherical, the scales 2–3-seriate, subequal or graduated with the outer shorter, lanceolate to lance-ovate, equaling or somewhat exceeding the disk. Receptacle somewhat convex; pales soft and scarious, with abruptly narrowed hairy tip, enfolding the achenes and falling with them. Rays long (1.5–4.5 cm.) and narrow, several-nerved, pubescent on back and tube, entire or tridenticulate, absent in one species; disk-corollas with cylindric tube abruptly widened into the throat, and 5-toothed pubescent limb. Anthers sagittate at base. Style-branches bluntish, pubescent. Achenes of ray triquetrous, sterile, rarely maturing and developing thin corky wings; of disk compressed, very flat, villous particularly on the margins (or glabrate in one species), with blackish body and white cartilaginous border passing above into 2 teeth or awns, these connected by a fringe of short confluent squamellae, sometimes completely united into a thick entire crown.— Scapose xerophytic perennials, with stout root and often much branched caudex, the short branches bearing tufts of thick oval or rhombic 3–5-nerved leaves, and one or several naked or 1–2-bracteate monocephalous scapiform peduncles. Type species *Encelia nudicaulis* Gray.— Four species of very arid regions of the southwestern United States.

Distinguished from *Helianthella* by the generally shorter squamellae, from *Encelia* and *Geraea* by usual presence of squamellae, and from all three by habit. Forming a connecting link between *Geraea* and *Helianthella*, and probably having developed as an adaptation to desert conditions of the mountain loving genus *Helianthella*.

Helianthella § *Enceliopsis* Gray, Proc. Am. Acad. xix. 9 (1883), & Syn. Fl. i. pt. 2. 283 (1884).

Enceliopsis A. Nels. Bot. Gaz. xlvii. 432 (1909).

*** Heads discoid; plant hispid-canescent.**

1. E. NUTANS (Eastw.) A. Nels. Root tuberiform, becoming very thick (3 cm.) and woody, bearing a short lignescent caudex from which proceed the 1–5 scapes and the tuft of crowded leaves; leaves oval, obtuse to rounded at tip, rounded at base, hispid-canescent with appressed hairs, 2–5 cm. long, on margined petioles 2–6 cm. long; scapes hispid with somewhat reflexed hairs, 1.5–2.5 dm. high, naked or with one or two narrow bracts; heads nodding in fruit, 2–4 cm. wide, 1.5–2 cm. high; scales densely hispid, lanceolate, 2–3-seriate,

11–15 mm. long, the outer shorter; pales about 15 mm. long, faintly nerved, pubescent on the back and subherbaceous narrow tip; disk-corollas 8 mm. long, tube $\frac{2}{3}$ length of throat; achenes 1 cm. long, obovate, very villous, the callous margin emarginate at apex.

Encelia nutans Eastw. Zoe ii. 230 (1891); Jones, Proc. Calif. Acad. ser. 2. v. 701 (1895).

Enceliopsis nutans A. Nels. Bot. Gaz. xlvii. 433 (1909).

Verbesina scaposa Jones, Zoe ii. 248 (1891), & Proc. Calif. Acad. l. c. (1895).

Specimens examined: COLORADO: Grand Junction, May 1892, *Alice Eastwood* (GN [30]); UTAH: Green River, alt. 1340 m., 23 May 1895, *Jones* 11859 (hb. Jones). Type material collected by Miss Eastwood on Orchard Mesa, Grand Junction, 17 May 1891. *Verbesina scaposa* Jones was described from material collected in sandy deserts near Grand River, eastern Utah, at Cisco, 2 May 1890.— This species grows in very poor clay soil containing a little active alkali (sodium carbonate) in open deserts (Jones, in litt.).

* * Heads radiate; plants densely white-pubescent.

+– Heads smaller, the rays [31] 1–2.5 cm. long; pubescence rather dull, not silvery; leaves mostly obtuse or rounded.

2. E. NUDICAULIS (Gray) A. Nels. Caudex more or less branched from a thick woody root, the branches short and stout, woolly and covered with the thick crowded bases of former leaves; leaves tufted, ovate to orbicular, subacute to rounded at both ends, white with a dense fine simple pubescence of several-celled glandular-based hairs, 2.5–6.5 cm. long, 1–6.5 cm. wide, on margined petioles one to three times their length; scapes 1.5–2.5 dm. high, pubescent like the leaves, usually bractless; heads 4–8 cm. in diameter including the rays; involucre densely pubescent like the leaves and stem, 3-seried, the scales slightly unequal, subulate-lanceolate from an ovate base, bluntish, 1–2 cm. long, equaling or barely surpassing the disk; rays about 20, glandular-pubescent on tube and back, tridentate, about 11-nerved, 1–2.5 cm. long, 2–6 mm. wide; disk-corollas 7 mm. long, with short tube and thick-cylindric throat, more or less glandular-pubescent; pales 12–15 mm. long, scarious, pubescent on back and tip and somewhat glandular, often laterally 1-toothed; mature achenes cuneate, 9 mm. long, 3.5 mm. wide, rather shortly silky-

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[30] In citation of specimens F = Field Museum; G = Gray Herbarium; N = National Herbarium.

[31] Ligule measurements are taken exclusive of tube.

villous except for a submarginal naked border, narrowly white-margined, awnless or with two stout subulate teeth or slender upwardly pubescent awns $\frac{1}{6}$–$\frac{1}{3}$ their length, connected by a fimbriate crown of nearly fused squamellae.

Encelia (*Geraea*) *nudicaulis* Gray, Proc. Am. Acad. viii. 656 (1873); Jones, Proc. Calif. Acad. ser. 2. v. 701 (1895).

Helianthella nudicaulis Gray, Proc. Am. Acad. xix. 9 (1883).

Enceliopsis nudicaulis A. Nels. l. c. (1909).

Enceliopsis tuta A. Nels. l. c. (1909).

Specimens examined: IDAHO: rather rare, dry rocky bluffs, Salmon River near Bay Horse, 5 Aug. 1895, *Henderson* 3653 (N); dry sage brush hills, above Salmon River, 6 Aug. 1895, *Henderson* 3653 (N); NEVADA: Candelaria, Esmeralda Co., 1881, *Shockley* (G); Hawthorne, Lepantha Mine, alt. 1677 m., 25 May 1897, *Jones* (N); compact clay slopes, alt. 305 m., Las Vegas, 29 April 1905, *Jones* 11857 (hb. Jones); limestone clays, Las Vegas, 4 May 1905, *Goodding* 2271 (G, type collection of *E. tuta*); clay, Horse Spring, alt. 915 m., 17 April 1894, *Jones* 5069k (hb. Jones); UTAH: St. Thomas or St. George, *Capt. F. M. Bishop* (HOLOTYPE in Gray Herb.); gravel at foot of precipitous slopes in very poor clay soil, Marysvale, alt. 1830 m., 4 June 1894, *Jones* 5376 (hb. Jones); Ferguson Spring, alt. 1920 m., 14 June 1900, *Jones* 6403 (hb. Jones); halfway station W. of Wa Wa, alt. 2135 m., 15 May 1906, *Jones* 11856 (hb. Jones).— Inhabits rocky or hard clay knolls where the soil is very compact (Jones, in litt.).

I am unable to separate satisfactorily *E. tuta* from the older *E. nudicaulis*. The type of the latter has medium-sized orbicular leaves, connected by the Shockley and Jones plants with the small subacute ones of *E. tuta*, while the Henderson plants, largest- and broadest-leaved of all, bear some smaller leaves identical in shape and tip with those of *E. tuta*, indicating that the latter represents only a starved phase of *E. nudicaulis*. The achenes appear to be rather variable in pubescence when young, and at maturity are strongly bidentate or with two awns of varying length, the longest that I have seen being about $\frac{1}{6}$ the length of the mature fruit, although when young they are often longer relative to the ovary. The squamellae, fairly distinct when young, become fused into a barely fimbriate crown on the ripe fruit.

+– Heads larger, rays 2–4.5 cm. long; pubescence silvery-velutinous; leaves rhombic-ovate, acute.

++ Achenes puberulent or glabrate; rays 3.5–4.2 cm. long, 6–12 mm. wide.

3. E. GRANDIFLORA (Jones) A. Nels. "Stems very thick and tufted, branched and very short, woody, densely covered with very

thick leaves;"[32] leaves all basal, broadly rhombic-oval or orbicular, subacute, velvety with appressed hairs especially when young, 4.5–8 cm. long, 3–6 cm. wide, on broadly margined petioles of about the same length; scapose peduncles channeled and finely pubescent, 3.5–4.5 dm. high, with 1–2 linear bracts; heads 11–12 cm. in diameter including rays; involucre densely short-pubescent, triseriate, the bracts little graduated, about 18 mm. long, tapering from an ovate base, exceeding the disk; rays 24–33, oblong, subentire or faintly tridentate, 3.5–4.2 cm. long, 6–12 mm. broad, about 11-nerved, pubescent on back chiefly along the veins; disk-corollas with slender tube and cylindric throat, glabrous except for the pubescent teeth, 6–7 mm. long; pales glandular-pubescent at apex, 11–14 mm. long, about 11-nerved; immature achene 6 mm. long, 2.5 mm. wide, appressed puberulent on body and margin or nearly glabrous, with two short ascending awns and a corona of short confluent squamellae; mature achene broadly obovate, 10 mm. long, 6.5 mm. broad, with blackish sparingly puberulent or glabrate body and broad whitish-yellow margin and fimbriatulate crown, the smoothish awns 1 mm. long.

Encelia grandiflora Jones, Proc. Calif. Acad. ser. 2. v. 702 (1895), not *E. grandiflora* (Benth.) Hemsl. (1881).

Enceliopsis grandiflora A. Nels. l. c. (1909).

Helianthella argophylla Coville, Contr. U. S. Nat. Herb. iv. 132 (1893), **not Gray.**

H. Covillei A. Nels. Bot. Gaz. xxxvii. 273 (1904).

Specimens examined: CALIFORNIA: Panamint Cañon, alt. 610 m., 3 May 1897, *Jones* 11855 (GN, and hb. Jones); banks of apparently calcareous clay, Hall Cañon, Panamint Mts., alt. 450 m., 18 April 1891, *Coville & Funston* 698 (G).— This species and the next are found only where sodium chloride is abundant, on cliffs adjoining salt deposits, but apparently never directly on salt flats (Jones, in litt.).

++ ++ Achenes villous; rays 2 cm. long, 4 mm. wide.

4. E. ARGOPHYLLA (D. C. Eaton) A. Nels. Base as in the last; leaves in a thick tuft, oblong-obovate or rhombic-obovate, silvery-velutinous, acute at apex, tapering to a broadly margined base, 3-nerved, 3.5–7 cm. long, 1.1–3.2 cm. wide, the petioles shorter; scapose peduncles 1 or 2, 2.5–3.7 dm. high, short-pubescent, bractless; heads 4.5–7.5 cm. in diameter including rays; involucre 2 cm. high, triseriate, the short-silky scales subulate-tipped, with broadly ovate base, exceeding the disk, the outer loose and reflexed; rays about 30,

32 Jones, l. c.

linear-oblong, 2 cm. long, 3–4.5 mm. wide; disk-corollas 7 mm. long (tube 3 mm.), hairy on teeth and base of tube; pales 13.5 mm. long, laterally 1-toothed, glandular-hairy on keel and tip; achene oblong, 10 mm. long, 3.5 mm. wide, silky-villous on body and margin, awnless or with two subulate awns 1.8 mm. long, the squamellae almost completely united.

Tithonia argophylla D. C. Eaton in Wats. Bot. King's Rep. v. 423 (1871).

Encelia (Geraea) argophylla Gray, Proc. Am. Acad. viii. 657 (1873); Jones, l. c. 702 (1895).

Helianthella argophylla Gray, Proc. Am. Acad. xix. 9 (1883); Coville, l. c. (1893), as to name only.

Enceliopsis argophylla A. Nels. l. c. (1909).

Specimens examined: UTAH: St. George, 1870, *Palmer* (fragments of TYPE in Gray Herb.); NEVADA: salty cliffs, salt mine near Stone's Ferry, near the Colorado River, alt. 366 m., 11 April 1894, *Jones* 5032q (hb. Jones).

GERAEA Torr. & Gray (γεραιός old, from the canescent-villous achenes). Heads medium-sized or rather large, many-flowered, radiate or discoid, the rays neutral; flowers all yellow. Involucre hemispheric, the scales 2–3-seriate, linear or broadly oblong, equaling or shorter than the disk. Receptacle flattish; pales softly scarious, conduplicate, falling with the achenes. Rays when present cuneate, the tube hairy; disk-corollas with cylindric tube and broader throat, limb hairy and 5-toothed. Style branches long, hairy. Disk-achenes strongly compressed, villous especially on the edges, narrowly cuneate with narrow whitish margin produced into two strong awns decurrent into the conspicuous crown.— Annuals or biennials (base unknown in *G. viscida*), glandular-pubescent, simple or branched, with alternate dentate leaves and usually few paniculate heads. Type species *G. canescens* Torr. & Gray (*Encelia eriocephala* Gray).— Two species of southwestern United States and adjacent Mexico.— The squamellaceous corona of the ovary, from which the thick crown of the fruit is at least in part developed, is distinct enough in *G. viscida*, although visible in *G. canescens* only as a narrow border connecting the decurrent based awns. It seems quite analogous with the corona of completely fused squamellae in such a species of *Enceliopsis* as *E. nutans*.

Geraea Torr. & Gray, Am. Journ. Sci. ser. 2. iii. 275 (Mar. 1847); Proc. Am. Acad. i. 48 (1848).

Simsia section *Geraea* Gray, Pl. Fendl. 85 (1849).
Encelia section *Geraea* Benth. & Hook. fil. Gen. Pl. ii. 378 (1873).

* Heads radiate; involucral scales linear, densely ciliate; lower leaves narrowed to a petiolar base.

1. G. CANESCENS Torr. & Gray. Erect annual, 1–6 dm. high, simple or branched from the base, hirsute with white hairs intermixed with stalked glands; leaves lance-oblong, ovate, or obovate, narrowed to a margined base, 1–7 cm. long, 0.3–0.4 cm. wide, acute, 3-nerved, bluntly or acutely toothed mostly above the middle, those of inflorescence bracteiform, all alternate or rarely one or two pairs of opposite ones at base of stem; heads few, somewhat panicled, terminating branchlets or long-peduncled from the upper axils, 5 cm. in diameter when well developed; involucre 8–12 mm. high, 2–3-rowed; the scales subequal or the outer a little shorter, linear-lanceolate, glandular on the back, 3-nerved inside, densely ciliate except at tip with long white hairs; rays 10–14, golden yellow, cuneate, subentire or tridentate, 11–21 mm. long, 6–11 mm. wide, the tube hairy; disk-corollas 6 mm. long, with short glandular-hairy tube and cylindric-funnelform throat; pales 9 mm. long, fimbriate-margined, glandular-hairy toward the narrowed apex; achenes narrowly cuneate, 6–7 mm. long, silky-villous, with flattened denticulate awns half their length, the body black, the narrow white margin continuous with the awns and the thick entire yellowish crown.

Geraea canescens Torr. & Gray, l. c. (1847).
Simsia (*Geraea*) *canescens* Gray, Pl. Fendl. l. c. (1849).
Encelia eriocephala Gray, Proc. Am. Acad. viii. 657 (1873).

Specimens examined: UTAH: southeastern part, 1870, *Palmer* (N); NEVADA: El Dorado Cañon, Lincoln Co., Jan.–Apr. 1895, *Lyra Mills* 12 (N); valley of the Virgin River, 6 May 1891, *V. Bailey* (Death Valley Exp. no. 1911: N); CALIFORNIA: Furnace Creek Cañon, Funeral Mts., alt. 100 m., Feb. 1891, *Coville & Funston* 361 (N); 8 miles N. of Salton Sea, Apr. 1910, *Mrs. C. H. Everhart* 2 (F); Palm Springs, alt. 150 m., 19 Apr. 1907, *S. B. Parish* 6079 (F); The Needles, 3 May 1884, *Jones* 3783 (FN); Agua Caliente, Mar. 1881 and Apr. 1882, *Parish Bros.* 228 (FN); Agua Caliente, *W. G. Wright* (G); Colorado Desert, Apr. 1889, *Orcutt* (N); same locality, *Wright* (FN); loose soil, near Calexico, 28 Mar. 1903, *Abrams* 3153 (G); in sandhills, Jan., Ft. Yuma, *Schott* (G); diluvial banks of the Colorado near Ft. Yuma, *Schott* (F); Colorado River, *Newberry* (G); interior of California, *Fremont* 393 of 1844, *Coulter* 304 (COTYPES in Gray Herbarium);

ARIZONA: Ft. Mohave, 1860–1, *Cooper* (GN); Beaver Dam, 1877, *Palmer* 237 (GN); Santa Rosa to Casagrande, 13 Mar.–23 Apr. 1903, *Griffiths* 4008, 4025 (N); Tule Desert, W. of Monument no. 180, 9 Feb. 1894, *Mearns* 2794 (N); without locality, 1880, *Lemmon* (G). SONORA: near El Capitan, southwest of Sonorita, west of Pinacate, 5 Feb. 1910, *Lumholtz* 27 (G).

1β. G. CANESCENS Torr. & Gray var. **paniculata** (Gray) Blake, n. comb. Greener and less hirsute than the ordinary form, paniculately much branched above, the very numerous heads only 2 cm. in diameter including the rays.

Encelia eriocephala var *paniculata* Gray, Syn. Fl. i. pt. 2. 282 (1884).

Specimens examined: ARIZONA: mesas near Phoenix, 17 June 1882, *Pringle* 1271 (FGN, TYPE COLLECTION).

* * Heads discoid; involucral scales oblong, densely glandular; leaves all sessile by a clasping base.

2. G. **viscida** (Gray) Blake, n. comb. Stout, at least 8 dm. high (the base unknown), hirsutely villous and viscid-glandular throughout; stem channeled, simple or branched above, leafy; leaves thin, oval or broadly ovate-oblong, acutish to obtuse or rounded, sessile by an auriculate or cordate base, irregularly dentate on the wavy margin, the midvein prominent, 3–10 cm. long, 1.5–5 cm. wide; heads rather few, terminating branchlets or long-pedunculate from the upper axils, 1.5–4 cm. broad, hemispherical; involucre shorter than the disk; scales 2–3-seriate, subequal or the outer shorter, oblong, obtuse, 3-nerved, densely glandular, 11–15 mm. long, 2–5 mm. broad; disk-corollas 7–8 mm. long, with rather long slender tube and cylindric throat, somewhat glandular particularly on the tube; pales 14 mm. long, glandular-pubescent toward apex; achenes 7–9 mm. long, with two villous awns more than half their length, narrowly wedge-shaped, silky-villous, with blackish body and white margin and crown.

Encelia (*Geraea*) *viscida* Gray, Proc. Am. Acad. xi. 78 (1876).

Specimens examined: CALIFORNIA: near Larkin's Station, 80 miles east of San Diego, 1875, *Palmer* (TYPE in Gray Herb.); Warner's Ranch, and other elevated places in San Diego Co., June 1880, *Parish* 241 (G); Campo, June 1880, *Vasey* 327 (N); mountains near Campo, 24 July 1883, *Orcutt* (F); dry hills near Campo, 26 May 1903, *Abrams* 3633 (FGN); Potrero Valley, San Diego Co., June 1889, *Orcutt* (N). LOWER CALIFORNIA: without locality, 1883, *Orcutt* (G).

ENCELIA Adans. (to Christopher Encel, who published a work on oak-galls in 1577).— Heads small or medium, radiate or rarely discoid, flowers yellow or purple. Involucral scales 2–3-rowed, subequal or the outer shorter, lanceolate to ovate-lanceolate. Receptacle convex; pales scarious, soft, embracing the achenes and falling with them. Rays entire or 2–3-toothed or -lobed, yellow, rarely absent; disk-corollas with short tube and usually cylindric-funnelform throat, the limb hairy and 5-toothed. Style-branches obtuse, short-pubescent outside. Disk-achenes compressed, very flat, oblong or obovate, villous on margins and glabrous or pubescent on the sides, narrowly white-margined, usually pappusless but in some species with two slender upwardly pubescent awns.— Alternate-leaved generally pubescent perennials, sometimes frutescent, with solitary to paniculate heads of usually yellow flowers. Type species *E. canescens* Lam.— About 14 species of western America, in arid regions and on the sea-coast, from Nevada to Lower California and central Mexico, and again from Peru to central Chili; one species on the Galapagos Islands.

Encelia Adans. Fam. ii. 128 (1763).

Pallasia L'Hér. ["Diss. (1784)"] in Ait. Hort. Kew. iii. 498 (1789), not of Houtt. 1775, nor Scop. 1777, nor L. fil. 1781, nor Klotzsch 1853 (the last a valid genus of *Rubiaceae*, the others all synonyms of various genera).

Eucalia Raeuschel, Nom. ed. 3. 251, 385 (1797), a nomen nudum.

Enchelya Lem. in Orb. Dict. Hist. nat. v. 300 (1844).

Encelya and *Enchelia* Baillon, Dict. Bot. ii. 517 (1886).

Key to the Species of Encelia.

A. Suffrutescent, leaves laciniately lobed.
  B. Leaves linear. . . . . 1. *E. ventorum.*
  B. Leaves ovate. . . . . 2. *E. laciniata.*

A. Leaves linear, unlobed.
  B. Heads panicled; plant resinous. . . . . 14. *E. stenophylla.*
  B. Heads solitary; leafy-stemmed; leaves glabrous beneath. 12. *E. angustifolia.*
  B. Heads solitary; scapose; leaves puberulent both sides. 13. *E. scaposa.*

A. Leaves oblong to ovate, unlobed.
  B. Heads paniculate, numerous; branches of inflorescence glabrous. 3. *E. farinosa.*
  B. Heads few or solitary; peduncles pubescent.
    C. Leaves cordate. . . . . 11. *E. Palmeri.*
    C. Leaves rounded or cuneate at base.
      D. Shrubby; disk yellow. 4. *E. frutescens.* 5. *E. albescens.*

D. Mostly herbaceous; disk purple.
E. Leaves tomentose or canescent with a rather soft pubescence; South American.....9. *E. canescens.*
E. Hispid-canescent; plant of the Galapagos Islands. 10. *E. hispida.*
E. Leaves greener, less pubescent; Mexican and Californian.
F. Involucre densely tomentose, or scabrous-pubescent in a variety.....8. *E. californica.*
F. Scales dorsally glandular, ciliate toward tip; leaves ovate, acute.....7. *E. halimifolia.*
F. Scales glandular-ciliate; leaves oval-oblong, obtuse. 6. *E. conspersa.*

Synopsis of Species.

* Laciniatae. Suffrutescent, with laciniately lobed leaves; achene pappusless; disk purple.

+ Leaves linear; peduncles a centimeter long.

1. E. ventorum Brandegee. Suffrutescent, much branched, 0.9–1.2 m. high, stem 5–7.5 cm. thick; the young branchlets glandular; leaves crowded toward tips of branches, fleshy, linear, with 1–5 linear alternate lobes above the middle, 3–6.5 cm. long, 1–2 mm. wide; heads "fragrant," glutinous, nodding on short peduncles, solitary at tips of branches, hemispheric, 10–12 mm. high; scales about 3-seriate, somewhat unequal, rather loose, lanceolate to lance-ovate, ciliate and glandular-dotted, becoming reflexed and somewhat woody in age; rays about 10, small, 8 mm. long, truncate, with rather long hairy tube; disk-flowers about 50, the corolla 5 mm. long, with short tube and cylindric-funnelform throat; pales greenish and glandular-puberulent on the keel, about 3-nerved on the sides, 7–11 mm. long; achenes 5.5–8 mm. long, oblong, truncate, narrowly margined, with villous margin and apex, glabrous on the sides.

Encelia ventorum Brandeg. Proc. Calif. Acad. ser. 2. ii. 175 (1889).

Specimens examined: Lower California: Lagoon Head, 6–15 Mar. 1889, *Palmer* 828 (GN); Playa Maria, July–Oct. 1896, *Anthony* 118 (FGN). Originally collected by Brandegee "on the narrow strip of sand between the lagoons and the ocean near the Boca de Las Animas."

+ + Leaves broader; peduncles 2.5–6.5 cm. long.

2. E. laciniata Vasey & Rose. Suffrutescent, 0.6–0.9 m. high, much branched, more or less glandular-pubescent, and usually hispid with ascending hairs on the younger parts; leaves ovate or obovate in outline, acute or obtuse, unequally and laciniately lobed with the lobes sometimes toothed, narrowed to a margined petiole, 3–5.5 cm. long, 1–2.5 cm. wide, lamina 2.5–6 mm. broad between the lobes; heads

terminal and long-peduncled from the upper axils, nodding in fruit, 10–12 mm. high; scales 2–3-rowed, loose, lanceolate, somewhat glandular, ciliate and tomentose; rays about 12, oval, subentire, 7 mm. long, with hairy tube; disk-corollas as in the last, glandular at base and tip, 5 mm. long; pales few-nerved, glandular-hairy toward the loose subherbaceous tip, 8–10 mm. long; achenes 5–6.5 mm. long, obovate, emarginate at apex, densely spreading-villous on the margin and with a few hairs toward the apex.

Encelia laciniata Vasey & Rose, Proc. U. S. Nat. Mus. xi. 535 (1889).

Specimens examined: LOWER CALIFORNIA: sand plains and hills above the bay, Lagoon Head, 6–15 Mar. 1889, *Palmer* 804 (FGN, TYPE COLLECTION); Ascension Island, Mar.–June 1897, *Anthony* 435 (G). Also reported by Brandegee from San Gregorio.— Anthony's plant differs from Palmer's in its thicker more bluntly lobed leaves, like the stem finely glandular-pubescent, nearly without the rough white hairs of the types.

* * HALIMIFOLIAE. Herbaceous or frutescent; leaves entire or merely repand-toothed, oblong to ovate; disk yellow or purple; achene rarely with 1 or 2 weak awns.

+ Heads numerous, paniculate, the branches of inflorescence smooth; leaves chiefly basal.

3. E. FARINOSA Gray. Much branched from a woody base, sometimes 1.6 m. high, the stems and branches exuding a fragrant resin, white-mealy becoming glabrate; leaves mostly basal, broadly ovate to lanceolate, acute or obtuse, entire or rarely repand-toothed, the margin often undulate, densely white-farinose occasionally becoming subglabrate, the nerves rather prominent beneath, 3–10 cm. long, 2–5 cm. wide, on narrowly margined petioles 1–4 cm. long; panicle nearly naked, the branches whitish-yellow, glabrous or rarely with a few hairs, often glandular-hairy just below the heads; heads terminating the branches, often nodding in fruit, radiate, disk 1–1.5 cm. in diameter; scales imbricated in 3–4 rows, the outer or sometimes all linear, the inner usually successively longer and with broader bases, loosely hairy when young, often glabrate when older, all blunt, the longest 3.5–7 mm. long, shorter than the disk; rays [33] about 12, usually conspicuous, 7–11 mm. long, oval-oblong, 3-lobed; disk-corollas 3.5–4.5 mm. long, glandular on the tube, yellow including the limb; pales 6–7 mm. long, glandular on keel, faintly nerved, entire or laterally 1-toothed; achene 4.5 mm. long, obovate, emarginate, villous all over except for a submarginal naked border, awnless.

33 In *Coulter* 327 (hb. Gray) some at least of the rays are styliferous, the only such instance known to me in the genus.

Encelia farinosa Gray in Torr. Bot. Emory Rep. Mil. Recon. 143 (1848).

Specimens examined: NEVADA: Muddy Valley, Lincoln Co., alt. 518 m., 1 May 1906, *Kennedy & Goodding* 8 (N); boulder washes, Las Vegas Mts., 13 May 1905, *Goodding* 2363 (G); CALIFORNIA: Panamint Cañon, alt. 610 m., 3 May 1897, *Jones* (N); Furnace Creek Ranch, Death Valley, 25 Mar. 1891, *Coville & Funston* 476 (FGN); near Bennett Wells, Death Valley, 22 Jan. 1891, *Coville & Funston* 202 (N); Los Angeles, 25 May 1902, *Braunton* 287 (N);[34] San Bernardino Mts., 1880, *Vasey* 286 (N); San Bernardino, 12 Jan. 1880, *S. B. Parish* (G); May 1881, *Parish* (F); 2 May 1896, *C. E. Cummings* (G); dry hills near San Bernardino, 27 Apr. 1891, *S. B. Parish* 2192 (N); vicinity of San Bernardino, alt. 305–457 m., 27 Apr. 1895, *S. B. Parish* 3638 (GN); foothills near San Bernardino, 15 May 1891, *S. B. Parish* (F); San Bernardino Hills, Apr. 1881, *Parish* (F); near Barstow, 12 Apr. 1905, *T. E. Wilcox* (N); The Needles, 8 May 1884, *Jones* 3853 (FN); Elsinore, 4 Apr. 1903, *Baker* 4151 (FG); Temecula Cañon, alt. 800 m., 31 Mar. 1898, *Leiberg* 3209 (N); Box Springs, San Diego Co., 10 May 1882, *Orcutt* (F); Signal Mt., Colorado Desert, 2 Apr. 1903, *Abrams* 3159 (G); Colorado Desert, Mar. 1881, *W. G. Wright* 185 (G); southeastern California, 1876, *Palmer* (G); southern California, 1876, *Parry & Lemmon* 181 (F); California, *Coulter* 327 (G); Colorado River, interior of California, 1854, *Bigelow* (G); Mexican Boundary Survey under Emory, 1846 (TYPE in Nat. Herb., no. 46083); eastern base of Coast Range, edge of Colorado Desert, 7 May 1894, *Mearns* 2969 (N); ARIZONA: Fort Mohave, 1860–1, *Cooper* (G); Beaver Dam, 1877, *Palmer* 239 (G); Grand Cañon of the Colorado, Journey of 1885, *Gray* (G); Verde Mesa, 1867, *E. Smart* 201 (N); buttes, Tempe, 19 Apr. 1892, *Ganong & Blaschka* (G); along the Gila, Mar. 1852, *Parry* 54 (G); Coyote to Santa Rosa, 13 Mar.–23 Apr. 1903, *Griffiths* 3986 (N); Laosa to Lavare via Babuquivari, 1903, *Griffiths* 3615 (N); Santa Catalina Mts., 19 Apr. 1881, *Pringle* (FG); Camp Grant, 2 Apr. 1867, *Palmer* 124 (G); Tucson Mts., Sept. 1907, *Thornber* (N); Tucson Mts., 1903, *Griffiths* 3475 (N); hills near Tucson, 8 May 1883, *Pringle* (F); Tucson, 8 Apr. 1892, *Toumey* (N), and 1 May 1892, *Toumey* 687 (N); Tule Mts., Mexican boundary line, 11 Feb. 1894, *Mearns* 2800 (N); near Monument no. 178, Mex. bound. line, 8 Feb. 1894, *Mearns* 2791 (N); Chimehuevis, alt. 915 m., 21 Apr.

[34] A MS. note attached to the sheet says in part: "This plant was just 10 ft. from root to fruit." The species is not included in Abrams' Los Angeles Flora.

1903, *Jones* (N). SONORA: common on plains from Huerigo to Granada, Guasabas, alt. 915–1220 m., 15 Nov. 1890, *Hartman* 233 (GN); Hermosillo, 10 June 1897, *F. S. Maltby* 229 (N); Torres, 10 June 1897, *Maltby* 179 (N); El Grupo (?), 13 Nov. 1895, *McGee* (N); hillsides, Guaymas, July 1887, *Palmer* 111 part (GN); Hermasillo, 4 Mar. 1910, *Rose, Standley, & Russell* 12354 (N); Empalme, 11 Mar. 1910, *Rose, Standley, & Russell* 12625 (N); Carral, 12 Mar. 1910, *Rose, Standley, & Russell* 12651 (N); Guaymas, 23 Apr. 1910, *Rose, Standley, & Russell* 15051 (N); Magdalena, 25 Apr. 1910, *Rose, Standley, & Russell* 15098 (N); SINALOA: thickets along Rio Fuerte, San Blas, 24 Mar. 1910, *Rose, Standley, & Russell* 13365 (N).—The only *Encelia* of any economic importance, and that but slight, the resin being burned as incense in the churches of Lower California, giving the plant the local name of "Incienso" (Brandegee, Zoe i. 83 (1890)).

3β. E. FARINOSA Gray f. **phenicodonta** Blake, n. forma, disco purpureo. Disk-corollas purple above; otherwise as in the typical form.—Specimens examined: CALIFORNIA: Riverside Mt., *Newberry* (G); ARIZONA: Williams Fork, Mar. 1876, *Palmer* 251 (FN). LOWER CALIFORNIA: west side of Lake Maquata, Colorado Desert, 27 Jan. 1890, *Orcutt* 2023 (N); cañon near San Quentin, 22 Apr. 1886, *Orcutt* 1341 (COTYPES in FGN); old diggings, Calmalli, alt. 366 m., Jan.–Mar. 1898, *Purpus* 33 (FN); La Paz, 20 Jan.–5 Feb. 1890, *Palmer* 50 (N); Santa Rosalia, 24 Feb.–3 Mar. 1889, *Palmer* 186 (GN); SONORA: Papago Tanks, Pinacate Mts., 14 Nov. 1907, *MacDougal* (N); hillsides, Guaymas, July 1887, *Palmer* 111 in part (GN).

3γ. E. FARINOSA Gray var. **radians** Brandeg. in herb., n. comb.—Leaves glabrate or nearly so; involucre nearly or quite glabrous, its bracts chiefly linear-oblong; disk purple.

Encelia radians Brandeg. Proc. Calif. Acad. ser. 2. ii. 176 (1889).

Specimens examined: LOWER CALIFORNIA: San José del Cabo, Mar.–June 1897, *Anthony* 433 (GN); same locality, Jan.–Mar. 1901, *Purpus* 398 (GN).

+– +– Heads few or solitary; peduncles usually pubescent; stem leafy.

++ Shrubby, even the branches woody; heads solitary at tips of long naked usually scabrous peduncles terminating the branches, often discoid; disk yellow; awns often present.

4. E. FRUTESCENS Gray.[35] A low much branched shrub, 1.3–1.6 m. high, white with a dense short very scabrous pubescence at least

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35 Often confused with *Viguiera Parishii* Greene, which is rather similar in aspect but has mostly opposite cordate-deltoid leaves and a pappus of squamellae as well as awns.

on the younger parts, the branchlets ending in long naked monocephalous peduncles; leaves short-petioled, oblong to ovate, obtuse or acute, cuneate or truncate at base, scabrous with scattered white hairs with persistent tuberculate bases, 1–3 cm. long, 0.6–1.6 cm. wide; involucre 6–10 mm. high, its scales somewhat unequal, 3-rowed, hispid-scabrous and sometimes slightly glandular, varying from linear-lanceolate to ovate-acuminate; heads 1–2.5 cm. broad; rays rarely present, then about 12, 3-lobed, about 9 mm. long; disk-corollas 5–6 mm. long, with glandular-hairy tube and hairy limb; pales glandular-pubescent, 1 cm. long; achenes black with narrow white margin, villous on the edges and somewhat pubescent on the sides, 6.5–8 mm. long, 2.5–3.2 mm. broad, awnless or with 1 or 2 weak villous awns.

Simsia frutescens Gray in Torr. Bot. Mex. Bound. 89 (1859).

Encelia frutescens Gray, Proc. Am. Acad. viii. 657 (1873).

E. frutescens f. *radiata* Hall, Univ. Calif. Pub. Bot. iii. 135 (1907).

E. frutescens f. *ovata* Hall, l. c.

Specimens examined: CALIFORNIA: Mohave Desert, near Bagdad, 12 Apr. 1905, *Wilcox* (N); The Needles, 3 May 1884, *Jones* 3812 (FN); near Cañon Springs, Apr. 1905, *Hall* 5859 (N); Palm Spring, alt. 61 m., 10 May 1903, *Jones* (N); wash near Coyote Wells, Colorado Desert, 3 Nov. 1890, *Orcutt* 2200 (GN); Signal Mt., 2 Apr. 1903, *Abrams* 3156 (FGN, cotype number of f. *ovata* Hall); interior of California, 1849, *Fremont* (G, COTYPE); ARIZONA: ravines in gravel plain, Ft. Mohave, 1860–1, *Cooper*, (GN, mixed with *Viguiera Parishii* Greene); Sierra Prieta near Ft. Yuma, *Schott* (G, COTYPE); Agua Caliente, 1846, *Emory* (G, COTYPE); Yuma, 1881, *Vasey* (N); west bank of Colorado River below Yuma, 7 Apr. 1894, *Mearns* 2853 (N); Yuma, 25 Apr. 1906, *Jones* (N); Santa Catalina Mts., Apr. 1881, *Lemmon* 188 (G); Red Rock, 11 June 1892, *Toumey* 671 (N); Carrizo Creek, *Hayes* 446 (G); mesas near Tucson, 8 May 1884, *Pringle* (FGN, cotype number of f. *ovata* Hall); mesas, without exact locality, 15 May 1881, *Pringle* (FG); foothills, Santa Rita Mts., 1902, *Griffiths & Thornber* (N); high plains, Lowell, 9 May 1884, *W. F. Parish* 110 (G); Wilmot Siding, 8 miles southeast of Tucson, on the mesas, 800 m., 6 June 1903, *Thornber* 83 (N); without locality, 1869, *Palmer* (N).

The form *ovata* described by Hall seems hardly distinct enough for recognition; apparently the lower leaves are always more or less ovate or ovate-oblong, the upper usually oblong but sometimes broader, but without any distinct line of demarcation; and the presence of rays, also, is a character scarcely requiring recognition by name.

The following sheets, with ovate leaves more or less glandular and with fine appressed pubescence, seem intermediate between this and var. *virginensis*: ARIZONA: near Ft. Verde, 20 June 1883, *Rusby*, (FN); along Bright Angel Trail to Grand Cañon, alt. 1000 m., 10 Sept. 1901, *Leiberg* 5926 (N); Hackberry, 24 May 1884, *Jones* (FN).

4β. E. FRUTESCENS Gray var. **resinosa** Jones in litt., n. var., hispido-scabra et plus minusve glandulosa interdum glandulosissima; foliis tenuibus margine sinuatis late ovatis 1–2 cm. longis latisque subacutis obtusisve basi truncatis vel rotundatis rare cuneatis utrinque plus minusve glandulosis scabris pilis albis basi tuberculatis; petiolis glanduloso-scabris 5–7 mm. longis; pedunculis 1–2 dm. longis glandulosis sparse scabris; capitulis 1–2 cm. diametro radiatis; involucri 2–3-seriatis squamis ovato-acuminatis vel lineari-lanceolatis dense glandulosis exterioribus interdum paucis pilis hispidis; paleis dense glandulosis; acheniis exaristatis.

Specimens examined: UTAH: near Great Salt Lake, *Capt. Bishop* (G); ARIZONA: without locality, 1869, *Palmer* (N); Little Colorado near Winslow, 10 June 1890, *Jones* (TYPE COLLECTION, GN); half mile below Tanner's Crossing, Little Colorado, 18 May 1901, *L. F. Ward* (N).

4γ. E. FRUTESCENS Gray var. **virginensis** (A. Nels.) Blake, n. comb. Leaves broadly ovate, cinereous-scabrous with a fine glandular pubescence intermixed with stouter tuberculate-based hairs like those found in the type; outer involucral scales linear-lanceolate, the inner ovate-acuminate; rays apparently always present; otherwise as in the typical form.[36]

Encelia virginensis A. Nels. Bot. Gaz. xxxvii. 272 (1904).

E. frutescens f. *virginensis* Hall, l. c. (1907).

Specimens examined: UTAH: valley of the Virgin River near St. George, 1874, *Parry* 142 (FG); La Verken, alt. 1036 m., May 1894, *Jones* 5195 (FN); southern part, 1875, *Johnson* (N); NEVADA: "The Pockets," valley of the Virgin River, 30 April 1902, *Goodding* 666 (FGN, COTYPES of *E. virginensis*); dry washes, Mesquite Well, 1 May 1905, *Goodding* 2259 (G); ARIZONA: northern part, 1872, *Wm. Thompson* 380 (N).

The following, with white-pubescent but scabrous leaves and more or less ovate-acuminate outer scales, seem intermediate between this variety and the next; UTAH: St. George, 1877, *Palmer* 238 (G);

36 According to Nelson's description the lower leaves are opposite, but I have been unable to find evidence of this in the material at hand, and opposite leaves are unknown elsewhere in the genus.

Nevada: Moapa, Lincoln Co., alt. 518 m., 12 May 1906, *Kennedy* 1112 (N); Arizona: 1869, *Palmer* part (N).

4δ. E. frutescens Gray var. **actoni** (Elmer) Blake, n. comb. Leaves ovate, cuneate or truncate at base, very rarely toothed, whitened with a rather soft fine pubescence; pubescence of stem and peduncles also softer than in the typical form; involucral scales mostly ovate-acuminate; rays apparently always present; otherwise as in the typical form.

Encelia actoni Elmer, Bot. Gaz. xxxix. 47 (1905).

E. frutescens f. *actoni* Hall, l. c. (1907).

Specimens examined: Nevada: Esmeralda Co., 31 May 1886, *Shockley* 416 (G); Candelaria, alt. 1677 m., June 1887, *Shockley* 540 (G); without locality, 1872, *Lt. Wheeler* (N); alt. 1050 m., Beattie, Nye Co., 5 June 1912, *Heller* 10422 (N); California: Pleasant Cañon, Panamint Mts., alt. 1677 m., 6 May 1897, *Jones* (N); near Independence, 29 May 1906, alt. 1160 m., *Hall & Chandler* 7217 (G); hillsides, Argus Mts., alt. 1220–1525 m., 1897, *Purpus* 5383 (GN); Tehachapi foothills, Kern Co., 30 May 1905, *F. Grinnell* (N); east slope of Walker Pass, Kern Co., alt. 1300 m., 21 June 1891, *Coville & Funston* 1020 (N); Rock Creek, desert slopes of San Gabriel Mts., alt. 1158 m., July 1908, *Abrams & McGregor* 548 (N); Liebre Mts., June 1908, *Abrams & McGregor* 402 (GN); Acton, June 1902, *Elmer* 3724 (N, type number of *E. actoni*[37]); Mohave Desert, June 1887, *S. B. Parish* (F); near Hesperia, Mohave Desert, 30 May 1901, *S. B. Parish* 4873 (N); San Francisquito Creek, 27 May 1905, F. Grinnell (N); San Francisquito Cañon, 26 May 1905 (N); Victor, alt. 792 m., 17 May 1903, *Jones* (N); San Jacinto, June 1901, *Hall* 2007 (N); San Felipe Cañon, 22 June 1888, *Orcutt* 1483 (N); San Jacinto, 14 Aug. 1907, *V. Bailey* (N); San Felipe, June 1852, *Thurber* 634 (G); San Isabel, June 1852, *Thurber* 634 (G); near San Felipe, 10 Oct. 1858, *Sutton Hayes* 443 (N); dry rocky hills, Jacumba, 31 May 1903, *Abrams* 3667 (GN); Smith's Mt., San Diego Co., 1880, *Vasey* 285 (FN); Arizona: Colorado River, *Schott* (G)[38]; "Jesup Rapids," 18 Feb. 1858, *Ives Expedition*, in part (N).

5. E. albescens Gray. Frutescent (?); branches striate, whitened with a roughish appressed pubescence, terminating in naked

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[37] Described by Elmer as having the ray-flowers styliferous, but I do not find them so.

[38] Originally taken by Gray (Bot. Mex. Bound. 88) to be *E. conspersa* Benth. and afterwards considered (Proc. Am. Acad. viii. 656) a small variety of *E. californica*, but best placed here.

similarly pubescent monocephalous peduncles; rameal leaves ovate, obtusish, barely toothed, whitened with an appressed scabrous pubescence particularly beneath, 2–2.5 cm. long, 0.9–1.2 cm. wide, short-petioled; involucre 7 mm. high, the scales subequal, in 2 rows, linear-lanceolate, appressed-pubescent and scabrous without; rays suborbicular, 3-lobed, 12 mm. long, pubescent on the back; disk-corollas 5 mm. long, pubescent on tube and teeth; pales 7 mm. long, scantily glandular-pubescent on back, fimbriate at apex; immature achene 4.7 mm. long, villous on margin, appressed-pubescent on the sides, bearing 2 unequal weak awns, or awnless.

Encelia albescens Gray, Proc. Am. Acad. viii. 658 (1873).

Specimens examined: SONORA: 1869, *Palmer* 21 (GN, COTYPES).— A doubtful species, known from very insufficient specimens, too close to *E. frutescens* var. *actoni*.

++ ++ Mostly herbaceous (except no. 6); heads always radiate, usually somewhat racemose; disk purple; awns absent (rarely present in one variety).

= Frutescent; leaves small, oblong, green; involucral scales glandular-ciliate.

6. E. CONSPERSA Benth. Shrubby, branched, the scabrous bark white; branches leafy below, terminating in nearly naked 1–3-branched peduncles, the branches monocephalous; leaves oblong to ovate, obtusish, cuneate or truncate at base, green, scabrous-pubescent especially beneath, 2–2.5 cm. long, 8–10 mm. wide, on petioles 3.5–7 mm. long; peduncles slightly scabrous; disk 1–1.3 cm. in diameter, 8 mm. high; involucre 5–6 mm. high, its scales unequal, 3-seriate, the outer lanceolate, the inner ovate, glandular on back and white-ciliate nearly to the tip; rays oval, slightly 3-lobed, pubescent on tube and back; disk-corollas 5 mm. long, with short tube, glabrous; pales 6 mm. long, about 9-nerved, glandular on the back; immature achenes 2.5 mm. long, villous on the margin, pubescent on the sides.

Encelia conspersa Benth. Bot. Voy. Sulph. 26 (1844).

Specimens examined: LOWER CALIFORNIA: Magdalena Island, 18 Jan. 1889, *Brandegee* (GN). Bentham's type came from Bay of Magdalena.— Brandegee's specimens well agree with Bentham's description, except that the branches are not "albo-tomentosis" nor the scales "lineari-lanceolatis." The species must remain somewhat in doubt until Bentham's type can be re-examined. As is suggested in Index Kewensis, it seems in the specimens at hand too close to *E. halimifolia* Cav.

= = More herbaceous; leaves larger, generally canescent or white-tomentose; involucral scales generally tomentose or canescent-pubescent.

× Leaves green; scales mostly ciliate.

7. E. HALIMIFOLIA Cav. Suffrutescent, branched, apparently diffuse, the stems, young branches, and in a less degree the peduncles canescent with fine incurved hairs; leaves ovate, acute or obtusish, cuneate or nearly truncate at base, entire or slightly repand-toothed, somewhat pubescent with incurved hairs but not canescent, 2.5–3.5 cm. long, 1.2–2 cm. wide, on petioles a centimeter long; peduncles axillary and terminal, simple or 2–3-branched, monocephalous, nearly naked; heads 8 mm. high, 1.2–1.4 cm. wide excluding rays; involucre 5–6 mm. high, the scales somewhat unequal, 2–3-seriate, linear-lanceolate, glandular-ciliate; rays 10–12, broadly oval, barely 3-lobed, pubescent on tube and back; disk-corollas 4.5 mm. long, with short tube, glabrous; pales 7.5 mm. long, glandular-pubescent on back; immature achene 3.6 mm. long, villous on margin, otherwise nearly glabrous.

Encelia halimifolia Cav. Icon. iii. 6. t. 210 ("1794" = 1795).

Pallasia grandiflora Willd. Sp. Pl. iii. 2261 (1804).

Specimens examined: SONORA: Yaqui River, 1869, *Palmer* 12 (FGN). There is also a sheet in Gray Herb. (ex herb. Klatt) labeled "Ex horto Scholae centralis Monspeliensis. *Mexico?* Peruvia!" but the specimen is doubtless from Mexico.

× × Leaves canescent or tomentose, or involucre densely pubescent.

○ Leaves green; involucre usually densely and softly tomentose; plants of California and Lower California.

8. E. CALIFORNICA Nutt. Much branched, somewhat spreading from a frutescent base, 6–10 dm. high, or on San Clemente Island becoming 3–3.6 m. high, 2.5–10 cm. in diameter; stem and peduncles canescent with fine incurved-spreading rather soft hairs; leaves from lanceolate to ovate, acute, cuneate or rarely slightly rounded at base, entire or somewhat repand-dentate, appressed-pubescent with soft hairs but distinctly green, 3–6 cm. long, 1–3 cm. wide, on petioles 0.5–3 cm. long; peduncles long, terminal and axillary toward ends of branches, nearly naked; disk 1.5–2.5 cm. in diameter; involucre 1–1.3 cm. high, the scales 2–3-seriate, lanceolate, densely tomentose; rays oblong, 14–20, pubescent on tube and exterior, 1.5–3 cm. long; disk-corollas 5 mm. long, glabrous or the teeth pubescent; pales 7.5–10 mm. long, glandular-puberulent above; achenes 5.5–6 mm. long, villous on margin and pubescent down the middle of each side, awnless.

Encelia californica Nutt. Trans. Am. Philos. Soc. ser. 2. vii. 357 (1841).

Specimens examined: CALIFORNIA: Santa Barbara, 1873, *Bolander* (G); also June 1875, *Rothrock* 82 (F), and May 1902, *Elmer* 3899 (FN); ocean bluffs, Santa Barbara, 16 May 1908, *Eastwood* 129 (FGN); near the 35th parallel, Whipple's Exp., 1853–4, *Bigelow* (N); San Fernando Valley, Feb. 1861, *Brewer* 187 ("bad smell", GN); beach above San Buenaventura, 5 Mar. 1866, *S. F. Peckham* (N); Pasadena, May 1903, *Grant* 395 (F); Santa Monica, Oct. 1881, *Parish Bros.* 964 (F); also 24 Jan. 1897, *J. H. Barber* 29 (N); near beach, Long Wharf, near Santa Monica, 13 Aug. 1910, *Blake* 693 (G); hillsides, May 1885, Los Angeles, *Hasse* (N); foothills, Griffith Park, 13 Mar. 1902, *Braunton* 242 (N); hillsides near Inglewood, 8 Mar. 1903, *Abrams* 3107 (G); Redondo, 25 May 1902, *Braunton* 288 (N); hills, Wilmington, 1 Apr. 1882, *Pringle* (FN); near Riverside, alt. 366 m., Apr. 1902, *Hall* 2922 (N); San Diego, *Parry, Newberry, Nuttall* (G); also 1875, *Palmer* 169 (F), 28 Feb. 1884, *Orcutt* (F), 15 Mar. 1882, *Jones* 3069 (N), 29 Jan. 1894, *H. A. Sheldon* 45 (N), 30 Mar. 1896, *C. E. Cummings* (G), 1 May 1902, *Brandegee* (Baker distr. 1657, FGN), May 1906, *Brandegee* (F); La Jolla, 16 Feb. 1895, *Snyder* (F); seashore, 30 m. from Lower California, 24 Feb. 1883, *G. C. Deane* (G); Catalina Island, 30 Jan. 1874, *Baker & Dall* (GN); Avalon, May 1898, *Trask* (N); San Clemente Island, 25 Aug. 1894, *Mearns* 4067 (N); Chalk Cañon, San Clemente Island, June 1903, *Trask* 204 ("10–12 ft. tall; 1–4 ins. diam.", N); ARIZONA: Ft. Mohave, 1860–1, *Cooper* 324 (N). LOWER CALIFORNIA: Todos Santos, 13 May 1882, *H. E. Fish* (F); San Quentin Bay, Jan. 1889, *Palmer* 661 (N), 662 (GN).— Bailey (Cyc. Am. Hort. ii. 529 (1900)) states that this species is in cultivation.

8β. E. CALIFORNICA Nutt. var. **asperifolia** Blake, n. var., frutescentior capitulis foliisque plerumque minoribus; disco 1.2–1.8 cm. diametro; pube caulium foliorumque asperiore; foliis ovalibus vel ovatis 1.5–3 cm. longis 1–1.5 cm. latis scabris subintegris; involucro breviore, pube densa aspera, squamis subglandulosis ad apicem subglabratis; acheniis rare cum aristis 1–2 tenuibus.

Specimens examined: LOWER CALIFORNIA: near Rosario and San Fernando, 4 May 1886, *Orcutt* 1346 (FGN); Lagoon Head, 40 miles inland, 6–15 Mar. 1889, *Palmer* 822 (GN); Cedros Island, 1875, *Streets* (GN), also 18–20 Mar. 1889, *Palmer* 702 (FGN: 1 or 2 weak awns present), Mar.–June 1897, *Anthony* 292 (COTYPES in FGN); San Benito Island, *Streets* (G); San Bartolome Bay, Mar. 1889, *Lt.*

C. F. Pond (N).— Often confused with *E. frutescens* Gray, from which the purple disk at once distinguishes it.

∘ ∘ Leaves canescent or tomentose; involucre not densely tomentose; plants of South America (except one species of Lower California, with cordate leaves).

\+ Leaves cuneate or rounded at base; plants of South America and the Galapagos Islands.

— Pubescence usually soft; heads (except in starved specimens) long-peduncled; South American.

9. E. CANESCENS Lam. Suffrutescent below, suberect, canescent with a rather soft pubescence, the stem about 6 dm. long; leaves broadly ovate, rounded at base, obtuse or rounded at tip, canescent with a soft pubescence, 2.5–5 cm. long, 1.6–3.5 cm. broad, on petioles 0.5–2 cm. long; inflorescence few-headed, terminal, the heads racemose or corymbose-paniculed; disk 1–1.5 cm. in diameter; involucre 5–7 mm. high, its rather loose bracts lanceolate to lance-ovate, somewhat triseriate, tomentose; rays about 12, broadly oval, faintly 2–3-lobed, 7 mm. long; disk-corollas 4.5 mm. long, the short tube glandular, the teeth hairy; pales 8 mm. long, glandular-hairy on the back; achenes 6 mm. long, 2.7 mm. wide, blackish with narrow white villous margin, pilose down the middle of the sides, awnless.

Encelia canescens Lam. Encycl. Method. ii. 356 (1786); Cav. Icon. i. 45. t. 61 (1791).

Coreopsis limensis Jacq. Coll. ii. 299 (1788), & Icon. Pl. Rar. iii. t. 594 (1786–1793).

Enselia limensis Jacq. Coll. l. c. 300; *Encelia limensis* Steud. Nom. ed. 2. 420 (1840).

Pallasia halimifolia L'Hér. in Ait. Hort. Kew. iii. 498 (1789).

Encelia alternifolia Raeuschel, Nom. ed. 3. 251 (1797).

Eucalia canescens Raeusch. l. c. (1797).

Specimens examined: PERU: dry seacoast, Payta, *Col. Hall* (G); Lima and San Lorenzo, *Gaudichaud* 112 (G); without definite locality, *Dombey* (G), *McLean* (G); *Wilkes Expl. Exp.* (N), approaching var. *oblongifolia*; CHILI: sandy places, Copiapo, Sept. 1854, *Lechler* 2801 (G).— Passes into the following varieties.

9β. E. CANESCENS Lam. var. PARVIFOLIA (HBK.) J. Ball. Pubescence denser, almost tomentose; leaves rhombic-ovate or ovate-lanceolate, cuneate at base, acute or subacute at tip; achenes rather more hairy.

Encelia parvifolia HBK. Nov. Gen. iv. 206 (1820).

Encelia canescens var. *parvifolia* J. Ball, Journ. Linn. Soc. xxii. 151 (1887).

Pallasia procumbens Spreng. Sys. iii. 610 (1826).

Encelia paucifolia Walp. Linnaea xiv. 505 (1840) [err. cler.].

Encelia pilocarpa Rusby, Bull. N. Y. Bot. Gard. viii. 131 (1912).

Specimens examined: PERU: Arequipa, 8 Aug. 1901, *Williams* 2526 (GN, type number of *E. pilocarpa*); without definite locality, *McLean* (G); CHILI: desert of Atacama, Sept.–Oct. 1890, *Morong* 1311 (FGN, distr. as *E. tomentosa* Walp.); sandy places near Caldera, May 1882, *Ball* (G). With no locality: *Wilkes Expl. Exp.* (N).

9γ. E. CANESCENS Lam. var. TOMENTOSA (Walp.) J. Ball. Apparently more frutescent; stem and the small broadly ovate blunt short-petioled leaves densely white-woolly.

Encelia tomentosa Walp. Linnaea xiv. 504 (1840).

Encelia canescens var. *tomentosa* J. Ball, Journ. Linn. Soc. xxii. 160 (1887).

Specimens examined: SOUTH AMERICA: *Wilkes Expl. Exp.*, without locality (N). Walpers says of his species: "e *Chili* misit *Filter*."

9δ. E. CANESCENS Lam. var. **oblongifolia** (DC.) Blake, n. comb. Leaves oblong-lanceolate to rhombic-ovate, somewhat less pubescent than in the typical form, about the shape of those of var. *parvifolia* but much less pubescent; heads apparently fewer, on much longer peduncles.

Encelia oblongifolia DC. Prod. v. 567 (1836).

Specimens examined: CHILI: Coquimbo, *Gaudichaud* 85 & 86 (G, COTYPE); Coquimbo, July–Aug. 1856, *Harvey* (G); without definite locality, *Gay* (G).

— — Pubescence harsh; heads racemose, on peduncles about 3 cm. long; plant of the Galapagos Islands.

10. E. HISPIDA Anderss. Branching, erect, 0.6–1 m. high, canescent with a dense hispid pubescence, the branches striate; leaves oblong, cuneate at base, subentire or repandly toothed, 4–5 cm. long, 1.4–2.2 cm. broad, on spreading-hirtous petioles 1–1.8 cm. long, appressed-hirsutulous above, more densely so beneath particularly along the veins; heads racemose in inflorescences terminating the branches, the arcuate-spreading peduncles linear-bracted at base, 2–3.5 cm. long, densely villous-hispid; heads small, 8 mm. high, 9–11 mm. wide exclusive of rays; involucre 4–5 mm. high, the scales lanceolate, 2-seriate, somewhat unequal, densely villous-hispid, the outer a little loose; rays oval, tridentate, pubescent on the back, 4.2 mm. long; disk-corollas 3.5–4.5 mm. long, the short tube and teeth pubescent;

pales 4.7 mm. long, upwardly villous; achenes (not quite mature) narrowly obovate, 4.5 mm. long, villous on margin and pubescent medially on the sides.

Encelia hispida Anderss. Om Galap.-Öarnes Veg. 73 (1853).

Specimens examined: GALAPAGOS ISLANDS: dry grassy places, Chatham and Charles Islands, *Andersson* (G, TYPE COLLECTION).

+ + Mature leaves cordate-ovate; plant of Lower California.

11. E. PALMERI Vasey & Rose. Suffrutescent, branched, 1 m. high, the stems whitened with a dense hispid pubescence, the branches rather sharply angled; leaves broadly ovate, cordate or rarely truncate at base, rounded or obtuse at apex or the younger acute, hispid-canescent on both sides or sometimes almost velutinous, entire or with blunt triangular teeth, 1.5–4 cm. long, 1.1–3.5 cm. broad, on petioles 3–10 mm. long, with ampliated base; heads peduncled, several in a glandular-hispid paniculate inflorescence, the bracts minute; disk 1–2 cm. broad; involucre 1 cm. high, the rather loose scales lanceolate to linear-lanceolate, triseriate, somewhat unequal, glandular on the back, densely villous on sides nearly to tip, somewhat pubescent inside; rays about 20, 10 mm. long, broadly oval, slightly trilobed, pilose on tube and back; disk-corollas 5 mm. long, nearly glabrous, the disk brownish purple; pale 8 mm. long, glandular-pubescent on the back above; achenes 4.5 mm. long, villous on the angles and slightly pubescent down the midline of the sides.

Encelia Palmeri Vasey & Rose, Proc. U. S. Nat. Mus. xi. 535 (1889).

Specimens examined: LOWER CALIFORNIA: Lagoon Head, 6–15 Mar. 1889, *Palmer* 805 (FGN, TYPE COLLECTION): San José del Cabo, Mar.–June 1897, *Anthony* 326 (GN); La Paz, 20 Jan.–5 Feb. 1890, *Palmer* 15 (GN).

* * * ANGUSTIFOLIAE. Leaves narrowly linear; awns present; disk yellow.

+– Leafy-stemmed; heads solitary, terminal; leaves glabrous beneath.

12. E. ANGUSTIFOLIA Greenm. An herbaceous perennial, the stems several, erect, 3–4 dm. high, striate, purplish below, slightly pubescent above, from a woody root; leaves scattered, narrowly linear, attenuate, subsessile, with 3 strong somewhat reticulated nerves, glabrous or nearly so below, appressed-hirsutulous above, 2.5–8 cm. long, 1.5–2.5 mm. wide, remotely serrulate; heads pedunculate, solitary, terminating the stems, about 1 cm. high, the peduncle bearing a slender bract just below the head; scales apparently few and rather loose, lance-attenuate, ciliate, 1–2-seriate; rays about 5, oblong, barely tridentate, 15 mm. long, 4 mm. wide; disk-corollas

rather few, 5.5 mm. long, pubescent on tube and teeth; pales 8 mm. long, pubescent; immature achene 2.5 mm. long, villous on the margin and slightly pubescent on the sides, bearing 2 upwardly pubescent awns about its own length.

Encelia angustifolia Greenm. Proc. Am. Acad. xxxix. 110 (1903).

Specimen examined: TERRITORY OF TEPIC: in the Sierra Madre, 13 Aug. 1897, *Rose* 3453 (G, TYPE COLLECTION).

+ + Scapose; head solitary, terminal; leaves puberulent both sides.

13. E. SCAPOSA Gray. Herbaceous perennial, simple and erect, 3.5 dm. high, the leaves all clustered at the base, the monocephalous scape naked except for two linear bracts; the lowest leaves scalelike; leaves linear, 3.5–8.5 cm. long, 1.5–4 mm. wide, attenuate, subsessile, with whitish cartilaginous margin and tip, rough-puberulent both sides; scape puberulent especially above, striate, whitish; head 1 cm. high, 2 cm. wide excluding the rays; scales linear-lanceolate, subequal, about 2-rowed, rather loose, white-hispid on the back; rays pubescent on tube and back, apparently rather numerous, oval, 15 mm. long, 6 mm. wide; disk-corollas 5 mm. long, pubescent on teeth and short tube; pales 10 mm. long, rather narrow, about 9-nerved, pubescent above; immature achenes 4.5 mm. long, pubescent on the sides, villous on margin and top, as are the two awns which are about as long.

Simsia? (*Geraea*) *scaposa* Gray, Pl. Wright. ii. 88 (1853).

Encelia scaposa Gray, Proc. Am. Acad. viii. 657 (1873).

Specimen examined: NEW MEXICO: stony hills between the Mimbras and the Rio Grande, Oct. 1851, *C. Wright* (G, TYPE COLLECTION).

+ + + Heads numerous, panicled; plant resinous.

14. E. STENOPHYLLA Greene. Perennial, the stems several and erect from a somewhat branched woody base bearing the scars of former leaves, more or less glutinous; leaves mostly crowded toward the bases of the stems, linear, 4.5–8 cm. long, 1–2 mm. wide, mucronulate, somewhat fleshy, glutinous, slightly hairy along the margin, the edges more or less revolute; heads corymbose-panicled toward tip of stem, on peduncles 1–3 cm. long; disk 8 mm. high, 7–11 mm. wide; involucre 3.5–4 mm. high, the scales lance-ovate, about 3-seriate, somewhat unequal, resinous and slightly ciliate, rather strongly ribbed; rays about 6, oval, entire, resin-dotted on tube and back, 5.5 mm. long; disk-corollas 4.5 mm. long, resin-dotted, the throat broadly oblong; pales 7.5–8.3 mm. long, rounded at tip, resin-dotted;

achene 5 mm. long, villous all over, the awns 2 mm. long, upwardly pubescent.

Encelia stenophylla Greene, Bull. Torr. Club, x. 41 (1883).

Specimens examined: LOWER CALIFORNIA: Cedros Island: *Veatch* (GF, TYPE COLLECTION); 3 May 1885, *Greene* (G); 18–20 Mar. 1889, *Palmer* 734 (FGN); Mar.–June 1897, *Anthony* 309 (FGN); 7 Apr. 1897, *Brandegee* (F).

TRANSFERRED AND DOUBTFUL SPECIES.

Encelia adenophora Greenm. Proc. Am. Acad. xxxix. 109 (1903) is to be transferred to *Simsia*.

Encelia amplexicaulis Hemsl. Biol. Centr.-Am. Bot. ii. 183 (1881) is a synonym of SIMSIA AMPLEXICAULIS (Cav.) Pers.

Encelia calva Gray, Proc. Am. Acad. viii. 658 (1873), is a synonym of SIMSIA CALVA Gray.

Encelia cedrosensis Rose, Contr. U. S. Nat. Herb. i. 17 (1890) = VERBESINA HASTATA Kell. (*V. venosa* Greene).

Encelia Chaseae Millsp. in Millsp. & Chase, Field Col. Mus. Bot. iii. 125 (1904), is to be transferred to *Simsia*.

Encelia collodes Greenm. Proc. Am. Acad. xxxix. 110 (1903), from Chiapas = FLOURENSIA **collodes** (Greenm.) Blake, n. comb. Habit very much like that of *F. laurifolia* DC., but heads fewer and radiate; immature achenes villous, the two awns united at base to several slender lacerate squamellae.

Encelia Conzattii Greenm. l. c. 111 (1903) = VERBESINA HYPOGLAUCA Sch. Bip. (as noted by Greenman in Gray Herb.).

Encelia cordata Hemsl. l. c. 183 (1881) is a synonym of SIMSIA CORDATA (HBK.) Cass.

Encelia dentata Poir. Encycl. Suppl. v. 665 (1817) = VERBESINA DENTATA (Humb. & Bonpl.) HBK.

Encelia exaristata Gray in Hemsl. l. c. 183 (1881) = SIMSIA EXARISTATA Gray.

Encelia foetida Hemsl. l. c. 183 (1881) is a synonym of *Coreopsis foetida* Cav., which is a *Simsia*.

Encelia fruticulosa Hieron. Bot. Jahrb. xix. 54 (1894) is based as to name on *Hopkirkia fruticulosa* Spreng. Sys. iii. 444 (1826), which is also *Armania fruticulosa* Bert. in DC. Prod. v. 576 (1836), a species not identified but certainly a *Simsia*. Hieronymus has renamed his specimens *Encelia Sodiroi*, q. v.

Encelia Ghiesbreghtiana Hemsl. l. c. iv. 57 (1887) is a clerical error for *E. Ghiesbreghtii* Gray.

Encelia Ghiesbreghtii Gray, Proc. Am. Acad. viii. 658 (1873), is to be transferred to *Simsia*.

Encelia glutinosa Rob. & Greenm. Am. Journ. Sci. ser. 3. l. 155 (1895) from Oaxaca = FLOURENSIA **glutinosa** (Rob. & Greenm.) Blake, n. comb. Habit much as in *F. collodes*, but petioles and young branches tomentose, heads numerous and corymbed, and the decidedly villous young achenes 2-awned but without squamellae.

Encelia grandiflora Hemsl. l. c. ii. 184 (1881) is a synonym of SIMSIA GRANDIFLORA Benth.

Encelia heterophylla Hemsl. l. c. 184 (1881) is a synonym of SIMSIA HETEROPHYLLA (HBK.) DC.

Encelia hirsuta Ktze. Rev. Gen. iii. pt. 2. 145 (1898), including f. *radiata* Ktze. l. c., is to be transferred to *Simsia*.

Encelia hispida Hemsl. l. c. 184 (1881) is a synonym of SIMSIA HISPIDA (HBK.) Cass.

Encelia hypargyrea Rob. & Greenm. Am. Journ. Sci. ser. 3. l. 155 (1895), from Oaxaca and Puebla, = VIGUIERA **argyrophylla** Blake, n. nom. (not *V. hypargyrea* Greenm. Proc. Am. Acad. xxxix. 105 (1903)). Pappus of two awns with several short fimbriate scales between; achene thickened and appressed-pubescent.

Encelia lagascaeformis Gray in Hemsl. l. c. 184 (1881) = SIMSIA LAGASCAEFORMIS DC. (as to name only).

Encelia maculata Brandeg. Zoe v. 259 (1908), from Puebla and Oaxaca = VIGUIERA **maculata** (Brandeg.) Blake, n. comb. Pappus and achene of *Viguiera*. Related to *Viguiera eriophora* Greenm. The specimens examined (*Purpus* 4127) have the ray-flowers styliferous.

Encelia megacephala Sch. Bip., a nomen in Ktze. Rev. Gen. iii. pt. 2. 145 (1898), is a *Simsia*.

Encelia mexicana Mart. in DC. Prod. v. 578 (1836) is a synonym of SIMSIA AURICULATA DC.

Encelia microcephala Gray, Proc. Am. Acad. viii. 657 (1873) = HELIANTHELLA MICROCEPHALA Gray, l. c. xix. 10 (1883).

Encelia microphylla Gray, l. c. xv. 37 (1880), from Coahuila = FLOURENSIA **microphylla** (Gray) Blake, n. comb. Habit of *Flourensia;* achene somewhat thickened (perfectly ripe fruit not seen), densely villous in the manner of *F. laurifolia* DC., with or without a pappus of 2 upwardly pubescent awns. The likeness to *Flourensia* of this species was commented on by Dr. Gray (Proc. Am. Acad. xix. 7, and Syn. Fl.).

Encelia montana Brandeg. Univ. Calif. Pub. Bot. iii. 394 (1909), from Cerro de Paxtle, Puebla (*Purpus* 3103) = VIGUIERA HELIAN-

THOIDES HBK. The ray-flowers are described as neutral by Brandegee, but in the specimens of the type collection examined are styliferous but undoubtedly sterile.

Encelia nivea Benth. Bot. Voy. Sulph. 27 (1844) has been variously identified, but from the opposite leaves and the thickened achenes cannot have been an *Encelia*, and was probably a *Viguiera*.

Encelia oblonga Rob. & Fern. Proc. Am. Acad. xxx. 118 (1894), from Durango and Chihuahua, is a synonym of *Helianthella Pringlei* Gray, Proc. Am. Acad. xxi. 389 (1886). The species, an alternate-leaved frutescent plant with large heads solitary and long-peduncled at tips of stems, and involucre of ovate-based long-attenuate somewhat foliaceous bracts much exceeding the slightly resinous disk, is somewhat anomalous in appearance, but seems best referred to *Flourensia* as F. **Pringlei** (Gray) Blake, n. comb. The achenes are oblong, 11 mm. long, much thickened, striate, densely pubescent, and tend at maturity to lose the 2 awns which compose the pappus.

Encelia pilosa Greenm. l. c. xxxix. 111 (1903) is a synonym of SIMSIA LAGASCAEFORMIS DC.

Encelia pleistocephala J. D. Sm. Bot. Gaz. xiii. 189 (1888) = VERBESINA PLEISTOCEPHALA (J. D. Sm.) Rob. Proc. Am. Acad. xliii. 41 (1907).

Encelia polycephala Hemsl. l. c. 184 (1881) is a synonym of SIMSIA POLYCEPHALA Benth.

Encelia Pringlei Fern. Proc. Am. Acad. xxxv. 573 (1900), from Hidalgo, has the pappus and achene of *Viguiera* and should be referred to that genus as VIGUIERA **trachyphylla** Blake, n. nom. (not *V. Pringlei* Rob. & Greenm. Proc. Am. Acad. xxix. 387 (1894).

Encelia purpurea Rose, Contr. U. S. Nat. Herb. i. 336 (1895) = SIMSIA LAGASCAEFORMIS DC.

Encelia resinosa Brandeg. Zoe v. 240 (1906), from Hidalgo, an alternate-leaved resinous shrub with a few racemose axillary large heads, seems best referred to *Flourensia* as F. **resinosa** (Brandeg.) Blake, n. comb. The young achene is flattish, scantily haired on the sides and thickly at the apex, with two long awns disposed to be trifid from near the base.

Encelia rhombifolia Rob. & Greenm. Am. Journ. Sci. ser. 3. l. 155 (1895), from Oaxaca = VIGUIERA **rhombifolia** (Rob. & Greenm.) Blake, n. comb. Pappus of two awns with intermediate short squamellae; achene thickened and pubescent.

Encelia sanguinea Hemsl. l. c. 185 (1881) = SIMSIA SANGUINEA Gray.

Encelia sericea Hemsl. l. c. 185 (1881) is a *Simsia*.

Encelia Sodiroi Hieron. Bot. Jahrb. xxix. 43 (1900) is a *Simsia*.

Encelia squarrosa Greenm. Proc. Am. Acad. xxxix. 112 (1903), from Guerrero = VIGUIERA **squarrosa** (Greenm.) Blake, n. comb. Achene and pappus quite of this genus. A very distinct species.

Encelia stricta Seaton, Proc. Am. Acad. xxviii. 120 (1893), from Mt. Orizaba and Esperanza, Mexico = VERBESINA **Seatoni** Blake, n. nom. (not *V. stricta* (Hemsl.) Gray, l. c. xix. 13 (1883)). Closely related to *V. hypomalaca* Rob. & Greenm. and to *V. stricta* (Hemsl.) Gray; distinguished from the latter by the not scabrous under leaf-surface, and from the former by the shorter broader crenate-dentate leaves not cordate-clasping at the base.

Encelia subaristata Gray in Hemsl. l. c. 185 (1881) is a synonym of SIMSIA SUBARISTATA Gray.

Encelia suffrutescens R. E. Fries, Nova Act. Soc. Sci. Upsal. ser. 4. i. no. 1. 83. pl. 6. fig. 1–3 (1905), from northern Argentina = FLOURENSIA **suffrutescens** (R. E. Fries) Blake, n. comb. Young achene plumpish, with two upwardly pubescent awns; habit of *Flourensia*, the heads radiate but scarcely resinous.

Encelia tenuis Fernald, Proc. Am. Acad. xxxiii. 94 (1897) is a *Simsia*.

SIMSIA Pers. (dedicated to Jacob Sims, editor of Curtis' Botanical Magazine from 1784 to 1816).— Heads small or medium, radiate or discoid, the flowers yellow or purple. Involucral scales in 3 or 4 rows, subequal or distinctly seriate, lance-ovate to lance-linear. Receptacle slightly convex; pales scarious, stiff, acuminate, conduplicate about the achenes, persisting after the fall of the latter. Rays slightly bidentate, yellow or rarely purple, sometimes wanting; disk-corollas with short usually pubescent tube and cylindric throat, 5-toothed, yellow or purple, sometimes changing color with age. Style branches attenuate, hispid-villous. Disk-achenes strongly compressed, very flat, obovate or oblong, glabrous or more often appressed-pubescent, never villous, with thin unmargined edges, calvous or usually biaristate.— Annuals or sometimes perennials, with at least the lower leaves opposite, and usually paniculate heads. Type species *S. ficifolia* Pers. and *S. amplexicaulis* (Cav.) Pers., both reducible to *S. foetida*.— About 22 species of western America, from the arid southwestern part of the United States to Argentina; one species in Jamaica.

Simsia Pers. Syn. ii. 478 (1807), excl. *S.? heterophylla* which = *Iostephane heterophylla* (Cav.) Benth.

Armania Bert. in DC. Prod. v. 576 (1836).

Barrattia Gray & Engelm. Am. Journ. Sci. ser. 2. iii. 274 (Mar. 1847).

Key to the Species of Simsia.

A. Rays purple.....22. *S. sanguinea.*
A. Rays yellow or wanting.
B. Leaves silky beneath.
C. Achenes glabrous.....19. *S. Ghiesbreghtii.*
C. Achenes appressed-pubescent.....20. *S. sericea.*
B. Leaves densely canescent-tomentose beneath.....8. *S. Sodiroi.*
9. *S. pubescens.*
B. Leaves neither silky nor densely canescent-tomentose beneath.
C. Petiole-bases connate, forming foliaceous disks.
D. Involucral scales subequal.....1. *S. calva.*
D. Scales 3–4-seriate.
E. Leaves hastately lobed; stems glandular-setose.2. *S. setosa.*
E. Leaves unlobed; stems merely glandular....3. *S. tenuis.*
C. Petiole-bases not connate into foliaceous disks.
D. Involucral scales 3–4-seriate, the outer ovate.
E. Achenes glabrous and awnless.
F. Petioles not auriculate.....4. *S. exaristata.*
5. *S. submollicoma.*
F. Petioles auriculate.....6. *S. eurylepis.*
E. Achenes pubescent, 2-awned.
F. Pales and scales purple-tipped; achene 5 mm. long.
7. *S. lagascaeformis.*
F. Pales scarcely purple-tipped; achenes 6–7 mm. long.
10. *S. Chaseae.*
D. Scales subequal, or the outer if shorter lance-oblong to linear-lanceolate.
E. Leaves 3-lobed, the lobes narrow, sessile by a margined base; achene 5–6 mm. long.....21. *S. triloba.*
E. Leaves unlobed, or the lobes if present broad, and the achene 4–4.5 mm. long.
F. Achenes 6–7.3 mm. long.
G. Leaf blade broadly deltoid, abruptly narrowed to a broadly margined clasping base; Mexican.
18. *S. megacephala.*
G. Leaves not clasping, grayish beneath with tuberculate-based hairs; South American..14. *S. hirsuta.*
15. *S. Dombeyana.*
G. Leaves not clasping, densely glandular-dotted both sides; Jamaican.....13. *S. jamaicensis.*
F. Achenes 4–5.3 (–6) mm. long.
G. Whole plant densely covered with stalked glands.
12. *S. adenophora.*
G. Glands less prominent.
H. Involucral scales herbaceous, scarcely striate; leaves mostly lobed, generally auriculate-clasping; Mexican & Guatemalan....11. *S. foetida.*
H. Scales corky-ribbed at base; heads large, disk 2–3 cm. in diameter; Central American.
16. *S. grandiflora.*
H. Scales not corky-ribbed; heads smaller, disk 1.2–1.7 cm. in diameter; Central American.
17. *S. polycephala.*

Synopsis of Species.

* Petiole-bases connate into conspicuous foliaceous stipule-like appendages; tuberous-rooted perennials, at least the first species.

+ Involucral scales subequal; heads solitary, long-pedunculate, terminating the branches.

1. S. CALVA (Gray & Engelm.) Gray. Erect, much branched, from a thick woody tuberlike root, harsh with white bristle-like hairs with swollen bases intermixed with a fine puberulence, the stem and branches striate-grooved; leaves opposite usually to tips of the branches, very harsh with a double pubescence like that of stem, lance-deltoid in outline, acute at apex, somewhat cordate at base, crenate-dentate, unlobed or hastately eared or deeply trilobed, 3–5 cm. long, 1.5–4 cm. wide, on short margined petioles 7–12 mm. long, their bases united into broad entire or lobed foliaceous disks; heads solitary on long naked peduncles terminating the branches, the disk 1–2.2 cm. wide; involucre 7–9 mm. high, the scales linear-lanceolate to linear-oblong, in about 3 rows, subequal or the outer series slightly shorter, densely hispid and covered with a fine puberulence, somewhat green-nerved; rays 20–30, yellow, somewhat livid without, oval, 8 mm. long, pubescent on tube and nerves of back; disk-corollas yellow, becoming purplish upwardly, puberulent, 6.5 mm. long, the tube very short; pales 8 mm. long, puberulent on back and subherbaceous tip; achene glabrous, emarginate, awnless, mottled with black and gray, 4.5 mm. long, 2.5 mm. broad.

Barrattia calva Gray & Engelm. Am. Journ. Sci. ser. 2. iii. 275 (1847).

Simsia calva Gray, Pl. Lindh. ii. 228 (1850).

Encelia (*Barrattia*) *calva* Gray, Proc. Am. Acad. viii. 658 (1873).

Specimens examined: TEXAS: rocky bluffs, Baird, Apr. 1882, *Reverchon* (N); rocky terraces of limestone hills, under stunted live oaks, Comanche Spring, June 1849, *Lindheimer* 60 (G); Comanche Spring, June 1849, *Lindheimer* 900 (FGN); Brazos, *Sutton Hayes* 47 part (F); dry hills, local, Austin, 22 Oct. 1891, *J. E. Bodin* 192 (N); rocky soil, in open woods between the headwaters of the Guadalupe and Pedernales Rivers, Oct. 1845, *Lindheimer* 432 (G, TYPE); top of dry hills, Pedernales, 1847, *Lindheimer* 39 (G); summit of rocky hills, Upper Guadalupe, 1846, *Lindheimer* 142 (G) [?= *Lindheimer* III 433: GN]; San Antonio, 28 July 1882, *Letterman* 5 (N); common in woods, San Antonio, 18 Sept. 1901, *Bush* 837 (N); Spring Creek, Gillespie Co., *G. Jermy* (F); Kerrville, alt. 487–610 m., June 1894,

Heller 1860 (N); Bexar Co., *Jermy* (N); foot of limestone hill, near Bracken, Bexar Co., 28 July 1903, *B. H. A. Groth* 143 (FG); rocky bluffs, Crockett Co., May 1885, *Reverchon* (FN); rocky bank, Devils River, 22 July 1900, *Earle* 439 (N); Pinto, 6 Sept. 1900, *Earle* 464 (N); Roma, 1889, *G. C. Neally* (N); southwestern Texas, 1879–80, *Palmer* 610 (GN), 611 (GN), 613 part (G); without definite locality, 1849, *Wright* 330 part (GN); "cultivated," *Hall* (N); *Mexican Boundary Survey under Emory*, 560 in part (N). NUEVA LEON: Sierra Madre, above Monterey, alt. 915 m., 17 Aug. 1903, *Pringle* 8739 (FGN); without definite locality, 1880, *Palmer* 615 part (N); TAMAULIPAS: Matamoros, April 1831, *Lindheimer* 2290 = 870 (G). Mexico, without definite locality, 1848–9, *Gregg* 85 (G).

1β. S. CALVA (Gray & Engelm.) Gray var. **subaristata** (Gray) Blake, n. comb. Similar in all respects to the last, except that the achenes are appressed-pubescent (sometimes only on the margin above) and usually provided with a pair of upwardly hispidulous awns, which may be reduced to mere traces.

Simsia subaristata Gray, Pl. Fendl. 84 (1849).

Encelia subaristata Gray in Hemsl. Biol. Centr.-Am. Bot. ii. 185 (1881).

Specimens examined: TEXAS: Brazos, *Sutton Hayes* 447 part (G); dry hills, Austin, 20 May 1872, *Hall* 339 (GN); Guadalupe, 20 miles W. of San Antonio, 1880, *Palmer* 612 (GN); Eagle Pass, San Antonio, &c., 1882, *Havard* 57 (G); San Angelo, 18–19 May 1899, *W. L. Bray* 356 (N); without definite locality, 1849, *Wright* 330 part (G); southwestern Texas, 1880, *Palmer* 613 part (N); *Mex. Bound. Surv. under Emory*, 560 part (N). TAMAULIPAS: Matamoros, Apr. 1836, *Lindheimer* 3010 = 1510 part (G); San Fernando to Jimeney, 26–27 Feb. 1902, *Nelson* 6603 (GN); NUEVA LEON: Bishops Hill near Monterey, 6 Feb. 1847, *Gregg* 47 (G, TYPE); Pico Chico, near Monterey, 18 Mar. 1900, *Canby, Sargent, & Trelease* 135 (N); COAHUILA: Caracol Mts., S. E. of Manclova, 1880, *Palmer* 615 part (G).— Often occurs mixed with *S. calva* on herbarium sheets.

+– +– Scales 3–4-seriate, the outer much shorter; heads paniculate.

++ Leaves hastately lobed; stems bristly-hairy as well as glandular: heads 1.5 cm. high, 1 cm. broad.

2. S. **setosa** Blake, n. sp., herbacea (inferiore caulis parte ignota) ubique dense glandulosa et parce setosa pilis albis patentibus; foliis ovato-lanceolatis basi sinu lato leviter cordatis et hastato-lobatis dentato-crenatis maximis 9 cm. longis 6 cm. latis; petiolis anguste marginatis 3.5–4 cm. longis basi in orbes dentatas latas conjunctis,

summis alternis denique minimis linearibus; capitulis paniculatis; disco 11–15 mm. alto 8–12 mm. diametro; involucri squamis 4-seriatis exterioribus sensim brevioribus striatis margine et apice minute glanduloso-strigosis lanceolatis interioribus lanceolato-attenuatis disco subaequalibus; radiis ca. 12 oblongo-ovalibus flavis 6.5 mm. longis; disci flosculis 8 mm. longis (tubulo 1.5 mm.) puberulo-glandulosis flavidis denique purpurascentibus; paleis 11.5 mm. longis lateraliter sublaceratis dorso et apice subherbaceo acuminato glanduloso-pubescentibus; acheniis 5 mm. longis 2.4 mm. latis appresse pubescentibus interdum subglabris supra ciliatis calvis vel cum aristis 2 tenuibus sursum ciliatis ad 2.2 mm. longis.

Specimens examined: SONORA: Alamos, 16–30 Sept. 1890, *Palmer* 741 (COTYPES in Gray Herb. and Nat. Herb., no. 46131).— Distributed as *Encelia mexicana*, from which it is very distinct.

++ ++ Leaves unlobed; stems merely glandular; heads 9–10 mm. high, 5–7 mm. wide.

3. S. **tenuis** (Fernald) Blake, n. comb. Base and lowest leaves unknown; stem finely and thickly glandular, only the ultimate branches of the inflorescence somewhat setose; leaves deltoid-ovate, cordate with broad shallow sinus, acute, crenate, glandular-puberulent and somewhat strigose, on glandular and setose barely margined petioles 1–2.5 cm. long, with their bases united into rounded crenate foliaceous disks; inflorescence much branched, the branches slender, the very slender peduncles 2–10 cm. long; heads short-cylindric; scales 3–4-seriate, distinctly graduated, the outer ovate, the inner lance-acuminate, glandular-puberulent, ciliate above, striate-veined; rays about 8, yellow, oval, 6 mm. long, barely bidentate, hairy on tube and slightly pubescent on back; disk-corollas 5.8 mm. long, glandular-puberulent on tube and pubescent above, yellow becoming purplish; pales 7–8 mm. long, glandular-puberulent; achenes dark-mottled, appressed-pubescent, awnless, 5 mm. long, 3 mm. wide.

Encelia tenuis Fernald, Proc. Am. Acad. xxxiii. 94 (1897).

Specimens examined: GUERRERO; rather scarce on edge of a cornfield, Nov. 1894, *Palmer* 96 (FGN, TYPE COLLECTION).

* * Petioles sometimes auriculate, not connate at base into disks; annuals or perennials.

+– Rays yellow.

++ Involucral scales distinctly unequal, the outer ovate, 3–4-seriate.

= Achenes glabrous and awnless.

× Petioles not auriculate.

4. S. EXARISTATA Gray. Annual, erect, much branched above, the stem and branches striate, covered with a fine glandular pubescence

intermixed with long hairs; leaves mostly opposite, ovate, acute, cuneate-truncate to cordate at base, subentire, crenate, or sometimes rather sharply toothed, tuberculate-strigillose with some longer hairs intermixed, the blade 5–11 cm. long, 2.5–8.5 cm. wide, on nearly naked petioles 1–7 cm. long, glandular-puberulent and fringed with long white hairs; heads numerous, paniculate, the bracts linear-lanceolate or broader; disk 1–1.3 cm. high, about as broad; involucre nearly or quite equaling the disk, about 3-seried, the inner scales lance-acuminate, the outer ovate or ovate-oblong and half their length, all striate, glandular on the back, ciliate particularly toward the tip, purple-tipped, the inner mostly purple; rays about 8, oval-oblong, under 8 mm. long, subentire, yellow, apparently sometimes wanting; disk-corollas 7 mm. long, glandular-puberulent particularly on tube and teeth, yellow turning purplish with age; pales 9–10 mm. long, narrow, glandular-puberulent and ciliate on the back and tip; achene blackish, glabrous and awnless, nearly truncate at apex, 4.5 mm. long, 2.3–2.8 mm. broad.

Simsia exaristata Gray, Pl. Wright. ii. 87 (1853).

Encelia exaristata Gray in Hemsl. Biol. Centr.-Am. Bot. ii. 183 (1881).

Specimens examined: TEXAS: valleys in the mountains east of El Paso, 1849, *Wright* 331 (GN); ARIZONA: Mexican Boundary Line, south of Bisbee, 14 Sept. 1892, *Mearns* 873 (N); southern part, 1881, *Lemmon* 575 (G); NEW MEXICO: southern part, *Mex. Bound. Surv. under Emory*, 561 (N). SONORA: valley of a tributary of the San Pedro, Sept. 1851, *Wright* 1224 (GN, TYPE COLLECTION); sandy places, Sept. 1851, *Thurber* 953 (G); CHIHUAHUA: valley near Chihuahua, 19 Sept. 1885, *Pringle* 321 (FGN); VERA CRUZ: Orizaba, *Botteri* 804 (G).

5. S. **submollicoma** Blake, n. sp., herbacea caule ramisque striatis puberulo-pilosis ad nodos canescentibus; foliis fere omnibus oppositis ovato-deltoideis cordatis sinu lato breveque vel superioribus truncatis crenato-dentatis paullulo hastato-lobatis acutis infra dense submolliterque pubescentibus pilis brevibus patentibus in venis longioribus supra subcanescentibus pube subsimile autem appressa asperaque 4–6 cm. longis 3–5.5 cm. latis, petiolis immarginatis puberulo-pilosis 1–3 cm. longis; capitulis subcorymbosis ramos terminantibus juventate ut gemmis dense pilosis maturitate 10–14 mm. alto 9–11 mm. diametro; involucro 1 cm. altitudine squamis acutis purpurascentibus triseriatis puberulis subdense pilosisque interioribus oblongis exterioribus ovatis duplo brevioribus: radiis (an semper) 0; corollis disci

6.5 mm. longis (tubulo 2 mm.) infra glanduloso-puberulis supra glanduloso-pilosis flavis denique obscurantibus; paleis latis 9 mm. longis appresse pubescentibus dorso et apice ciliatis; acheniis atris truncatis glabris calvis 4.5 mm. longis 2.8 mm. latis.

Specimens examined: TAMAULIPAS: weed in waste places, growing in clusters, vicinity of Tampico, alt. 15 m., 10 Mar.–19 Apr. 1910, *Palmer* 250 (TYPE in Gray Herb.).

× × Petioles auriculate.

6. S. **eurylepis** Blake, n. sp., herbacea foliis inferioribus et basi invisis; caule striato sparse puberulo et pilis longis mollibus nonnullis; foliis remotis maxima ex parte alternis ovatis acutis basi subtruncatis subintegris vel infra dentatis utrimque pubescentibus pilis brevibus patentibus basi tuberculatis venas secundum subhispidis, petiolo vix marginato puberulo-glanduloso ad basin latas in auriculas integras ampliato; capitulis plerumque glomeratis in pedunculis longis nudis terminalibus, eradiatis 1.2–1.4 cm. altitudine 1–1.5 cm. diametro; involucro discum subaequante 3–4-seriato squamis sensim gradatis interioribus oblongis 7–9.5 mm. longis 2–2.5 mm. latis extimis ovalibus 4.5 mm. longis 2.5 mm. latis acutis striatis puberulo-glandulosis et subpilosis supra purpureo-brunneis; corollis disci flavis denique purpurascentibus 8 mm. longis (tubulo 2.2 mm.) infra et in dentibus puberulis; paleis 8.5 mm. longis apice pilosis a latere subdentatis; acheniis nigricantibus emarginatis calvis glabris 5.5 mm. longis 3.4 mm. latis.

Specimens examined: SAN LUIS POTOSI: district Cuidad del Maiz near Gallinas, Feb. 1888, *C. & E. Seler* 684 (TYPE in Gray Herb.).

= = Achenes pubescent and biaristate.

× Tips of pales and inner scales purple; leaves not tomentose beneath; Mexican.

7. S. LAGASCAEFORMIS DC. Annual, erect or rarely somewhat spreading, usually much branched; stems and branches striate, glandular-pubescent and pilose particularly near the nodes; leaves opposite below, alternate in the inflorescence, broadly deltoid-ovate, unlobed or rarely hastately 3-lobed, the margin crenate or subentire, acute, the base truncate or cordate with broad sinus, beneath granular-puberulent, pilose along the veins, or when young almost tomentose, above strigillose, the hairs tuberculate-based, intermixed with longer looser ones, the blades 3–12 cm. long, 2–13.5 cm. wide, on purplish naked glandular-puberulent pilose-fringed petioles 1.5–5 cm. long; heads numerous, cymose-paniced, the branches somewhat pilose and stipitate-glandular; heads cylindric becoming hemispheric, 10–12 mm. high, 5–8 mm.

wide; involucre nearly equaling the disk, its scales 3-ranked, striate, purple-tipped, glandular-puberulent, ciliate, the outer ovate, the inner oblong-lanceolate, all acute; rays 5–8, small, oval to oval-oblong, 5 mm. long, yellow; disk-corollas 5.5–6 mm. long, glandular-puberulent, yellow becoming purplish; pales truncate or retuse and mucronate, ciliate on back and tip, glandular, purplish above, striate, 6–8 mm. long; achene appressed-pubescent, mottled with brownish-gray and black, bearing 2 slender upwardly pubescent fimbriate-based awns, 5 mm. long, 2.5 mm. wide.—A photograph of the type of *Simsia lagascaeformis*, kindly sent me by M. C. de Candolle, who also writes that the achenes are hairy and biaristate (not glabrous as originally described), proves that this long-misunderstood species is identical with *E. pilosa* Greenm., which in all technical characters is the same as *E. purpurea* Rose. The latter species, known only from two plants collected by Palmer in 1891, and represented by sections in the Gray and National herbaria, seems to be merely a peculiarly branched and perhaps somewhat teratological condition, with very numerous capitula and somewhat flattened branches.

Simsia lagascaeformis DC. Prod. v. 577 (1836).

Encelia (*Simsia*) *purpurea* Rose, Contr. U. S. Nat. Herb. i. 336 (1895).

Encelia pilosa Greenm. Proc. Am. Acad. xxxix. 111 (1903).

Specimens examined: San Luis Potosi: alt. 1830–2440 m., 1878, *Parry & Palmer* 472 part (G); Colima: in a creek bottom, Colima, 9 Jan.–6 Feb. 1891, *Palmer* 1105 (GN, type collection of *E. purpurea*); Puebla: maize fields, Rio de San Francisco, Aug. 1909, *Purpus* 3826 (FGN); Tehuacan, 7 Nov. 1903, *Holway* 5340 (G); Oaxaca: Las Sedas, alt. 1830 m., Sept. 1894, *C. L. Smith* 277 (N); between Coixtlahuaca and Tamazulapam, alt. 2000–2500 m., 12 Nov. 1894, *Nelson* 1937 (GN); valley of Etla, alt. 1700 m., 23 Oct. 1895, *L. C. Smith* 854 (G); Ocotlan, Dec. 1901, *Conzatti & González* 1263 (G); without definite locality, alt. 1750 m., July–Aug. 1900, *Conzatti & González* 1002 (G); 25 Oct. 1899, *Holway* 3740 (G); 17 Oct., 1899, *Holway* 3747 (G).

× × Pales and scales not purple-tipped, or else leaves densely canescent-tomentose beneath; plants of Yucatan, Columbia, and Ecuador.

o Leaves canescent-tomentose beneath; scales pilose.

8. S. **Sodiroi** (Hieron.) Blake, n. comb. Said to be suffrutescent and 2 m. high; stem and branches striate, short-pubescent and somewhat glandular; leaves all but the uppermost opposite, ovate-lanceolate, acute, truncate or subcordate at base, roughish with appressed

hairs above, canescent-tomentose beneath, crenate-serrate, 4–7.5 cm. long, 3–6 cm. wide, on puberulent-pilose wingless earless petioles 1–1.5 cm. long; heads rather closely corymbed at tips of branches, the short peduncles densely pubescent; heads 1.2 cm. high; involucre triseriate, the outer scales ovate, densely pilose, half the length of the oblong less pilose inner ones, all acute and striate; rays few, yellow, oblong, 8 mm. long;[39] disk-corollas 7 mm. long, pilose on tube and teeth, yellowish becoming darker; pales 9 mm. long, laterally somewhat toothed, pilose on back and tip; achenes 4.3 mm. long, 1.9 mm. wide, blackish, more or less appressed-pubescent on sides and tip, bearing 2 slender slightly ciliate awns.

Encelia mexicana Klatt, Engl. Bot. Jahrb. viii. 43 (1887), not Mart.

Encelia fruticulosa Hieron. l. c. xix. 54 (1894), not *Hopkirkia fruticulosa* Spreng. Sys. iii. 444 (1826), fide Hieron. Engl. Bot. Jahrb. xxix. 43 (1900).

Encelia Sodiroi Hieron. Engl. Bot. Jahrb. xxix. 43 (1900).

Specimen examined: COLUMBIA: open savannas of the Rio Dagua, Cauca, alt. 800 m., 15 July 1883, *Lehmann* 2964 (G). Reported also by Hieronymus from Ecuador, along the Guallabamba R. (type locality).

9. S. PUBESCENS Triana. "Suffrutex erectus; ramis gracilibus, multi-angulatis, minute puberulo-hirtis; foliis inferioribus oppositis, superioribus alternis ovato-lanceolatis acutis dentato-serratis, supra pubescentibus, subtus dense pubescenti-canescentibus, deorsum subabrupte in petiolum longum attenuatis, petiolo basi auriculato-amplexicauli; involucri squamis striatis, dorso tenuiter pubescentibus, exterioribus ovatis, interioribus oblongo-lanceolatis, utrisque acutis; capitulis pedunculatis, laxe corymbosis; acheniis atris, alatis, oblongis, undique decumbenti-pilosis.

"Crescit altitudine 1400 metr. inter *Tena* et *El Colegio*, in devexis occidentalibus Andium Bogotensium."

Simsia pubescens Triana, Ann. Sci. Nat. Bot. sér. 4. ix. 40 (1858).

This species, not since recognized, appears to differ from *S. Sodiroi* only in its auriculate-amplexicaul petioles and perhaps in the less pubescent scales of the involucre, and may be identical with that species, but in the absence of specimens it seems unwise to combine them.

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39 Described by Hieronymus as stylose, but neutral in the Lehmann plant which he refers to *E. Sodiroi*.

∘ ∘ Leaves merely puberulent beneath except along the veins; scales glandular-hispid.

10. S. **Chaseae** (Millsp.) Blake, n. comb. Herbaceous, the base unknown; stem and branches striate, glandular-hispid particularly in the inflorescence; only the lower leaves opposite, thin, ovate-deltoid, acute, broadly wedge-shaped at base, crenate-dentate with blunt teeth, above granular-scabrous, beneath rather softly puberulent and somewhat pilose along the veins, 5–6 cm. long, 3–5.5 cm. wide, narrowed into margined glandular-setose petioles 1.5 cm. or less long, the upper sessile and oblong-lanceolate; heads corymbose-paniculate, 1–1.2 cm. high; scales somewhat triseriate, the outer ovate-lanceolate, glandular-hispid, shorter than the lance-oblong inner ones which are glandular on back and ciliate toward tip; rays sometimes wanting, when present 8–10, yellow, elliptic, 4–7 mm. long; disk-corollas 5.5 mm. long, pubescent, yellow; pales 8–9 mm. long, broad, the margin denticulate, green-ribbed, hispidulous on the keel; achenes 6–7 mm. long, 3.5–4 mm. broad, appressed-pubescent and short-ciliate, bearing two upwardly ciliate awns about half their length.

Encelia Chascae Millsp. in Millsp. & Chase, Field Col. Mus. Pub. Bot. iii. 125, pl. (1904).

Specimens examined: YUCATAN: ruins of Kobah, 26 Nov. 1865, *Schott* 911 (TYPE no. 176020, Field Mus.); "herb, 5 feet high, common at Izamal, Oct.," *Gaumer* 910 (FG); Chichankanab, *Gaumer* 2045 (F); San Anselmo, *Gaumer* 2046 (F).

+ + Involucral scales subequal, or the outer if shorter linear-lanceolate to lance-oblong.

= Leaves ovate or ovate-deltoid, unlobed except in *S. foetida*, the lobes when present broad.

× Leaves not silky-pubescent beneath.

∘ Involucral scales herbaceous throughout, scarcely striate; the usually lobed leaves generally broadly auriculate-clasping at base of petiole; achenes small, 4–4.5 mm. long.

11. S. **foetida** (Cav.) Blake, n. comb. Annual, erect, often much branched, the stem usually purplish, glandular-puberulent and hispid with tuberculate-based hairs; lower leaves opposite, the upper often alternate, ovate or deltoid, often 3-lobed, particularly the upper, crenate-dentate, acute at apex, broadly cuneate or cordate at base, hispid with tuberculate-based hairs longer along the veins, the blade 5–14 cm. long, 3–12 cm. wide, the petioles usually margined, often broadly so, and generally auriculate-clasping at base; heads numerous, panicled, the peduncles glandular-hispid; heads 1 cm. high, radiate;

involucre equaling disk, the scales subequal, about 2-rowed, lance-acuminate, glandular-hispid, herbaceous nearly throughout, slightly or not at all striate, the inner sometimes purplish; rays about 10, yellow, oval, pubescent on tube, faintly bidentate, 10 mm. long; disk-corollas 6 mm. long (tube less than 1 mm.), puberulent, yellow turning purple; pales 9 mm. long, purplish and glandular above; achenes black or mottled, appressed-pubescent, 4–4.5 mm. long, 2–2.4 mm. wide, the 2 upwardly pubescent awns fimbriate at base.— Very variable in leaf-form, even on the same plant, but not satisfactorily divisible even into formae.

Coreopsis foetida Cav. Icon. i. 55. t. 77 (1791).
Ximenesia foetida Spreng. Sys. iii. 606 (1826).
Encelia foetida Hemsl. Biol. Centr.-Am. Bot. ii. 183 (1881).
Simsia ficifolia Pers. Syn. ii. 478 (1807).
Coreopsis amplexicaulis Cav. Descrip. 226 (1802).
Simsia amplexicaulis Pers. l. c. (1807).
Encelia amplexicaulis Hemsl. l. c. (1881).
Ximenesia cordata HBK. Nov. Gen. iv. 228 (1820).
Simsia cordata Cass. Dict. lix. 137 (1829).
Encelia cordata Hemsl. l. c. (1881).
Ximenesia heterophylla HBK. l. c. 227. t. 380 (1820).
Simsia heterophylla DC. Prod. v. 577 (1836), not Pers. l. c.
Simsia Kunthiana Cass. l. c. (1829).
Encelia heterophylla Hemsl. l. c. 184 (1881).
Simsia auriculata DC. l. c. v. 577 (1836).
Encelia mexicana Mart. in DC. l. c. 578 (1836), as syn.; Gray, Proc. Am. Acad. xix. 8 (1883).
Ximenesia hirta Mart. l. c. 578 (1836), as syn.
Helianthus amplexicaulis DC. l. c. 589 (1836).
Simsia Schaffneri Sch. Bip. in Gray, Proc. Am. Acad. xix. 8 (1883).
Specimens examined: CHIHUAHUA: southwestern part, 1885, *Palmer* 440 part (N); COAHUILA: Saltillo, Sept. 1898, *Palmer* 422 (FG); Parras, 16 May 1847, *Gregg* (G); Parras, Oct. 1898, *Palmer* 427 (FGN); without definite locality, 1880, *Palmer* 493 (GN); DURANGO: Durango, Sept. 1896, *Palmer* 657 (FGN); SAN LUIS POTOSI: Villa de Guadalupe, Sept. 1855, *Schaffner* 19 (G); sandy places near San Luis Potosi, Aug. 1876, *Schaffner* 265 (G); woods about San Luis Potosi, 1876, *Schaffner* 389b (G)[40]; sandy cultivated grounds, 1880, *Schaffner* 389a (G)[40]; alt. 1830–3050 m., 1878, *Parry & Palmer*

[40] "'Lamyrote' incolarum."

471 (GFN); alt. 1830–2440 m., 1878, *Parry & Palmer* 472 part (G); fields, Cardenas, 3 Nov. 1891, *Pringle* 5090 (G); JALISCO: Bolaños, Sept. 1897, *Rose* 2875 (G); Guadalajara, Oct. 1886, *Palmer* 622 (GN); fields near Guadalajara, 1 Nov. 1893, *Pringle* 4622 (FGN); GUANAJUATO: Leon, *Mendez* (G, fragments of type of *Helianthus amplexicaulis* DC.); 1895, *Dugès* 455 (G)[41]; QUERETARO: alt. 1800 m., 12 Dec. 1898, *Deam* (F); HIDALGO: fields near Dublan, 2074 m., 19 Sept. 1902, *Pringle* 9897 (FGN); fields, Pachuca, Sept. 1905, *Purpus* 1542 (FGN); VERA CRUZ: La Luguna, 22 Jan. 1906, *Greenman* 33 (F); Orizaba, *Botteri* 805, 808 (G); on a volcanic mountain, near Tantoyca, 1858, *L. C. Errendberg* 378 (G); near Orizaba, *Botteri & Sumichrast* 122 (G); MICHOACAN: Patzcuaro, 29 Oct. 1895, *C. & E. Seler* 1185 (G); MEXICO: fields, Salto de Aqua, Oct. 1905, *Purpus* 1541 (FGN); Ixtaccihautl, Jan. 1903, *Purpus* (N); near Mexico City, *Berlandier* 927 (G, type collection of *S. auriculata* DC.); Valley of Mexico, 1848–9, *Schmitz* (G); fields, Valley of Mexico, Sept.–Oct. 1865–6, *Bourgeau* 850 (GN); Valley of Mexico, Aug. 1856, *Schaffner* 162 (G, type of *S. Schaffneri* Sch. Bip.); near San Angel, *Schaffner* (G); Tacubaya, 20 June 1865–6, *Bourgeau* 155 (G); plaza, Chalchicomula, 27 July 1901, *Rose & Hay* 5808 part (G); PUEBLA: Mt. Orizaba, alt. 2440 m., 14 Aug. 1891, *Seaton* 329 (FGN); Cholula, 1 Jan. 1899, *Deam* 73 (FG); without definite locality, alt. 2000 m., Nov. 1895, *Conzatti* 131 (G); OAXACA: near Puebla, alt. 2135 m., 8 Nov. 1895, *L. C. Smith* 909 (G); CHIAPAS: plains, 1864–70, *Ghiesbreght* 540 (G). Mexico, without locality, *Hartweg* 145 (G); *Coulter* 359 (G); "Mexico Commu," 21 Sept. 1865–6, *Bourgeau* 959 (G); 1905, *Lemmon* (G). GUATEMALA: Dept. Quiché, alt. 1372–3660 m., Apr. 1892, *Heyde & Lux* 3396 (FG); Laguna Amatitlan, Dept. Amatitlan, alt. 1250 m., Feb. 1890, *Heyde & Lux* 2408 (F).

11β. S. FOETIDA (Cav.) Blake var. **decipiens** Blake, n. var., pappo nullo, achenio glabro. As the typical form, but achene glabrous and pappusless; leaves mostly entire, but at least the upper auriculate-petioled.— It is barely possible that the specimen is a hybrid with *S. exaristata*, with which species it was identified by Dr. Gray; but the heads and leaf-bases are quite those of *S. foetida*.

Specimen examined: CHIHUAHUA: southwestern part, Aug.–Nov. 1885, *Palmer* 440 part (TYPE in Gray Herb.).

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[41] "Vulg. Mirasol amarillo ou Lampotillo" (i. e. yellow turnsol or little fire).

o o Scales somewhat corky basally, generally strongly striate; leaves very rarely lobed; achenes usually larger, 6–7 mm. long (except in nos. 12 and 17).

+ Whole plant densely covered with stalked glands; petioles never auriculate; achene 5.3 mm. long or less.

12. S. **adenophora** (Greenm.) Blake, n. comb. Erect annual, branched above, 1–2.5 m. high, setose and yellowish with dense stalked glands; lower leaves opposite, deltoid-ovate, rarely 3-lobed, acute, truncate or shallowly cordate at base, crenate-dentate, 6.5–12 cm. long, 5–13 cm. wide, setose and glandular both sides, on marginless densely glandular petioles 1–8 cm. long, never auriculate, the upper lance-acuminate, gradually reduced to linear-lanceolate bracts; heads panicled, rather numerous, 10–17 mm. high; involucre slightly exceeding disk, 3-rowed, the scales densely glandular-hispid, subequal, lanceolate, striate and somewhat corky-ribbed at base, the narrow herbaceous tips loosely spreading; rays when present yellow, about 12, 7–8 mm. long, 3.5 mm. wide; disk-corollas pubescent, 6 mm. long, yellow turning purplish above, the tube only 0.6 mm. long; pales 9 mm. long, laterally dentate, appressed-pubescent above; achenes blackish, 5–5.3 mm. long, 2.9 mm. wide, appressed-pubescent and slightly ciliate, with 2 finely and upwardly pubescent awns 3–4 mm. long.

Encelia adenophora Greenm. Proc. Am. Acad. xxxix. 109 (1903).

Specimens examined: Jalisco: fields and copses, Tequila, Sept.–Oct. 1893, *Pringle* 4602 (FGN, type collection); Etzatlan, 2 Oct. 1903, *Holway* 5092 (G); Morelos: limestone hills near Yautepec, alt. 1372 m., 21 Oct. 1902, *Pringle* 9898 (FGN); Guerrero: between Tlapa and Tlaliscatilla, alt. 1190–1372 m., 5 Dec. 1894, *Nelson* 2045 (GN); Oaxaca: Monte Alban, near Oaxaca City, alt. 1677–1830 m., 8 Oct. 1894, *C. L. Smith* 236 (N); hills of Soledad de Etla, alt. 1830 m., 19 Nov. 1895, *L. C. Smith* 894 (G); Hacienda Guadalupe, alt. 1600 m., 7 Oct. 1906, *Conzatti* 1529 (F); without definite locality, 10 Nov. 1903, *Holway* 5360 (G).

+ + Usually less glandular, the glands mostly sessile; petioles sometimes auriculate; achene usually 6–7 mm. long.

— Lower leaves (at least) not with broadly margined clasping bases; the upper sometimes cordate-clasping.

A. Achenes 6–7.5 mm. long, or if smaller, the bracts strongly ribbed.

B. Leaves rather densely glandular-dotted both sides; mature heads 1.5 cm. in diameter; achene 7 mm. long; Jamaican.

13. S. **jamaicensis** Blake, n. sp., herbacea erecta ramosa 1.3–2.5 m. alta foliis infimis et radice invisis; caule ramisque multistriatis hirsutis dense glandulosis praecipue in inflorescentia ubi glandulae pedatae sunt; foliis inferioribus late ovatis crenato-dentatis acutis basi cuneato-

truncatis 8–15 cm. longis 5.5–15 cm. latis utrobique pilis basi glandulosis tectis venas paginae inferioris secundum et supra ubique hirsutis, glandulis inferiore in superficie conspicuoribus quam eis specierum affinium, petiolis immarginatis 2–4.5 cm. longis infra glandulari-hirsutis supra complanatis pilosis saepe basi subauriculatis; foliis summis sensim lanceolatas ad bracteas sessiles reductis; capitulis non paucis cymoso-paniculatis pedunculis 2–6 cm. longis dense glandulosis et patenti-hirsutis; disco 15–17 mm. alto maturitate 1.5 cm. aetate 18–24 mm. diametro; involucri biseriati squamis subaequalibus vel interioribus paullo longioribus oblongo-lanceolatis subobtusis striatis glandulosis et strigoso-hirsutis; radiis vel nullis vel ca. 10 ovalibus parvis flavis; corollis disci 6.5 mm. longis (tubulo 2 mm.) flavis puberulo-glandulosis; paleis 9–12 mm. longis ad apicem glandulosis viridicarinatis cuspidatis; acheniis 6–7.5 mm. longis 2.4–3.5 mm. latis nigricanti-maculosis appresse aliquid pubescentibus aristis 2 subaequalibus 4–4.5 mm. longis.

Specimens examined: JAMAICA: vicinity of Kingston, alt. 152 m., 29 Jan.–4 Feb. 1900, *Clute* 2 (COTYPES in Gray Herb. and Field Mus. no. 83001: distributed as "*Verbesina gigantea* Jacq.?"); Kings House Grounds, alt. 183 m., 17 Nov. 1897, *Harris* 6953 (F); Hope Grounds, alt. 198 m., 4 Dec. 1901, *Harris* 8228 (F); Hope Road, 13 Jan. 1898, *Harris* 6989 (F); Long Mountain Road, alt. 91 m., 19 Nov. 1907, *Harris* 10001 (FN).

B B. Leaves grayish with short tuberculate-based hairs especially beneath; mature heads 1.5–2 cm. broad; achene 7 mm. long; South American.

14. S. **hirsuta** (Ktze.) Blake. n. comb. Erect branched annual 1–1.5 mm. high, the stem and branches substriate, glandular-puberulent and setose; lower leaves ovate, acute, subcordate or cuneate-truncate at base, repand-dentate to subentire, setose along the veins, roughish both sides with short white hairs with swollen bases, some gland-like particularly on the upper surface, 8 cm. long, 5 cm. wide, on puberulent-setose marginless petioles 1 cm. long, the uppermost sessile and lance-oblong; heads rather few, cymose-paniculate, on glandular-puberulent and setose peduncles 2.5–14 cm. long; heads chiefly discoid; involucre 10–13 mm. high, equaling the disk, its scales subequal, 2-rowed, lanceolate-subulate, striate, glandular-pubescent and hispid; disk-corollas 5 mm. long (tube 0.6 mm.), glandular-puberulent, yellow; pales 1 cm. long, glandular-puberulent above; achene mottled, appressed-pubescent all over, oblong, obcordate, 6.5–7 mm. long, 2.7–3.6 mm. wide, the upwardly pubescent awns 2.5 mm. long.

Encelia hirsuta Ktze. Rev. Gen. iii. pt. 2. 145 (1898).

Encelia hirsuta Ktze. f. *radiata* Ktze. l. c.

Specimens examined: ARGENTINA: Dique near Cordoba, Dec. 1891, *Kuntze* (N, COTYPES of *E. hirsuta* Ktze.). Also reported by Kuntze from Sierra de Cordoba, Argentina, *Lorentz;* Peru (f. *radiata*, leg. *Dombey*); and Cartagena, Columbia, *Billberg*.

15. S. DOMBEYANA DC. "Caule terete sparse hispido et inter setas minute puberulo-glanduloso, foliis superioribus alternis petiolatis late ovatis irregulariter repando-dentatis hinc inde sublobatis acutis utrinque setis hispidulis et puberulo-glandulosis, capitulis paucis breviter pedicellatis, invol. squamis lineari-lanceolatis acuminatis disco longioribus, ligulis paucis minimis, achaeniis obcordatis biaristatis margine ciliolatis.— in Amer. austr. verisim. in Peruvia legit Dombey. Petioli valde hispidi, setis ut in tota planta longis patulis mollibus. (v. s. comm. à Mus. reg. Par.)"

Simsia Dombeyana DC. Prod. v. 578 (1836).

M. Casimir de Candolle, to whom I sent fragments of Kuntze's cotypes of *E. hirsuta* for comparison with the Prodromus type of *S. Dombeyana*, states that the latter is distinguished by its more hairy achenes with awns nearly as long as the paleae, and by the more long-triangular leaves with the long hairs thinner and the short ones nearly pulverulent.

B B B. Leaves glandular-puberulent; heads large, 2–3 cm. in diameter, the rays rather prominent; the scales broader and more corky-ribbed than in any related species; achene 5–6 mm. long; Central American.

16. S. GRANDIFLORA Benth. Erect annual, 1.6 m. high, subsimple or branched above; stem and branches setose, striate, rather sparsely glandular-puberulent; lower leaves opposite, broad-ovate, acute, truncate at base, crenate or crenate-serrate, setose along the veins, glandular-puberulous both sides, the glands more prominent on the lower surface, 7–14.5 cm. long, 4.5–10 cm. wide, on naked glandular-setose petioles 1.5–8 cm. long; the upper decurrent into winged amplexicaul bases, the uppermost sessile, subentire, lance-ovate; heads few, axillary and terminal, hemispheric even in anthesis, the disk 1.5–2 cm. high, 2–3 cm. wide, equaled or slightly surpassed by the involucre; peduncles setose and glandular, 2–12 cm. long; involucre triseriate, the inner scales slightly longer, lance-ovate to ovate-oblong, subacute, glandular-hispid, with about 4 conspicuous light thickened ribs in the lower half, the central pair most prominent, the upper part herbaceous; rays oval, about 20, yellow, 9 mm. long, 4.2 mm. wide, rather prominent, usually present; disk-corollas 5.5–6 mm. long (tube 1.3 mm.), yellow, glandular; pales 9–10 mm. long, puberulent on keel

and margin above; achene blackish or dark-mottled, ovate-oblong, subobcordate, appressed-pubescent, 5–6 mm. long, 2.5 mm. wide, bearing 2 awns 4–5.5 mm. long.

Simsia grandiflora Benth. Vidensk. Medd. Kjöbenh. for 1852. 92 (1853).

Encelia grandiflora Hemsl. Biol. Centr.-Am. Bot. ii. 184 (1881).

Specimens examined: NICARAGUA: very common on the high plateaus toward the Pueblos, Niquinohomo, Dept. of Granada, 13 Feb. 1903, *Baker* 2419 (GN); waste land near Granada, alt. 40 m., Jan. 1870, *P. Levy* 355 (Bot. Mus. Copenhagen); COSTA RICA (?): sunny pastures near Ojos de Agua,— 352 & 382 (G, ex herb. Klatt). There seems to be no place of this name in Costa Rica, and the town so called in Honduras may have been intended. Bentham's type (*Oersted* 100) came from Volcan el Viejo, Nicaragua.

A A. Achene 5 mm. long; bracts not strongly ribbed; Central American.

17. S. POLYCEPHALA Benth. Base not seen; stem and the numerous branches densely glandular and pilose-hispid; middle leaves ovate or ovate-lanceolate, acuminate, truncate or subcordate at base, crenate-dentate, glandular-hispid both sides, 4–7 cm. long, 3.5–5 cm. wide, on nearly marginless densely glandular-hispid petioles 1.5–2.5 cm. long, with slightly enlarged bases; heads numerous, cymose-paniculate, on glandular-setose peduncles 1–7 cm. long; disk 11–13 mm. high, 12–17 mm. broad; involucre nearly as tall, its scales triseriate, subequal or the outer a little shorter, glandular-hispid, oblong-lanceolate, bluntish, only slightly striate-ribbed; rays 5–7 mm. long, yellow; disk-corollas 6 mm. long (tube 1.5 mm.), yellow, glandular below, pubescent on the teeth; pales 8–10.5 mm. long, pubescent above, greenish toward the apex; achenes blackish, appressed-pubescent chiefly on margin and middle, 5 mm. long, 2.6–3.5 mm. wide, the awns 3.2 mm. long.

Simsia polycephala Benth. Vidensk. Medd. Kjöbenh. for 1852. 93 (1853).

Encelia polycephala Hemsl. Biol. Centr.-Am. Bot. ii. 184 (1881).

Specimens examined: GUATEMALA: Cerro Redondo, Dept. Santa Rosa, alt. 1372 m., Oct. 1894, *Heyde & Lux* 6160 (FGN); Chupadero, Dept. Santa Rosa, alt. 1600 m., Oct. 1892, *Heyde & Lux* 3810 (FG).

— — Even the lower leaves abruptly contracted to broadly margined clasping bases.

18. S. **megacephala** Sch. Bip. in herb., herbacea supra ramosa glandulari-pubescens et praecipue in inflorescentia piloso-

hirsuta; foliis inferioribus deltoideis vel ovato-deltoideis utrimque glandulari-hirsutis venas tres secundum praecipue, lamina 7–10 cm. longa lataque acuta infra abrupte fere truncate contracta in portionem petioliformem late marginatam media in parte 1.2–1.7 cm. basi 1.7–3.5 cm. latam, superioribus sensim ad bracteas ovatas reductis; capitulis non paucis axillaribus et terminalibus in pedunculis 4–14 cm. longis; disco 1.3–1.5 cm. alto 1.7–2.2 cm. diametro; involucro quam eo paullo breviore squamis 2–3-seriatis exterioribus paullo brevioribus acutis lanceolatis glandulari-hirsutis valde costatis; radiis ca. 20 flavis ovalibus 6.5 mm. longis; corollis disci flavis 5.5–6 mm. longis (tubulo 1 mm.) infra et in dentibus puberulis; paleis 9 mm. longis supra hirsutulis; achenio nigricante dense appresse pubescente 7.2 mm. longo 3.3 mm. lato aristis 2 sursum ciliatis basi fimbriatis 4 mm. longis.

Specimens examined: GUANAJUATO: near cultivated gardens, Cerro de Cuarto, Sept. 1903, *Dugès* 12 (G). Also the following cultivated specimens: Harvard Botanic Garden, 1866, "e sem. Hort. Par."; Botanic Garden of Deidesheim, Rhine-Palatinate, 25 Nov. 1859, *Schultz Bipontinus* (TYPE in Gray Herb.).

× × Leaves silky beneath.

∘ Achenes glabrous, awnless; branches puberulent and pilose.

19. S. **Ghiesbreghtii** (Gray) Blake, n. comb. Lower part of stem unknown; branches apparently few, opposite, like the stem purplish, glandular-puberulent and pilose; leaves all opposite, ovate-lanceolate, acuminate, truncate or subcordate at base, serrate, canescent above with a short glandular-pubescence, silky with dense appressed hairs beneath, 4.5 cm. long, 2–2.5 cm. wide, on densely pilose marginless petioles a centimeter long; heads few or solitary towards tips of branchlets, the disk 10–11 mm. high, 10 mm. wide, equaled by the periclinium, this triseriate, the outer scales a little shorter, all subulate-linear, glandular-puberulent and pilose-hirsute; rays about 10, pale yellow, purplish-tinged outside, oblong, 11 mm. long, 4.6 mm. wide; disk-corollas yellow, puberulent particularly on tube, 6–6.5 mm. long (tube 1.2 mm.); pales 9.5 mm. long, pubescent on the subherbaceous keel above, very acute; immature achene 3.5 mm. long, oblong, glabrous and awnless.

Enceliа (*Barrattia*) *Ghiesbreghtii* Gray, Proc. Am. Acad. viii. 658 (1873).

Enceliа Ghiesbreghtiana Hemsl. Biol. Centr.-Am. Bot. iv. 57 (1887), clerical error for *E. Ghiesbreghtii* Gray.

Specimen examined: CHIAPAS: mountain forests, 1864–70, *Ghiesbreght* 568 (TYPE in Gray Herb.).

∘ ∘ Achenes appressed-pubescent, biaristate; branches puberulent.

20. S. **sericea** (Hemsl.) Blake, n. comb. Herbaceous?, erect, the stem and nearly opposite branches slender, terete, striate, densely glandular-puberulent; leaves mostly opposite, lance-ovate, acuminate, truncate or slightly rounded at base, remotely and obscurely serrulate, densely glandular-strigillose above, softly silvery-silky beneath, 4–9 cm. long, 1.5–3.5 cm. broad, on densely glandular short-pilose petioles about 1 cm. long; heads rather few, corymbed toward tips of branches, on peduncles 2–5.5 cm. long; disk 1 cm. high, about as broad, exceeding the involucre; the latter triseriate, the scales graduated, the inner lance-attenuate, the outer ovate-lanceolate, glandular-puberulent and hispid-ciliate; rays "about 7," 1 cm. long; disk-corollas 6.5 mm. long, puberulent, yellow; pales 8 mm. long, stiff, scarious, acuminate, glandular-pubescent on keel and tip, laterally lacerate-dentate; achene 3.2 mm. long, 1 mm. wide, densely appressed-pubescent, the awns ampliate and lacerate toward the base, 1.5 mm. long.

Encelia (*? Simsia*) *sericea* Hemsl. Biol. Centr.-Am. ii. 185 (1881).

Specimens examined: GUATEMALA: Antigua, dept. Sacatapéquez, 13 Feb. 1905, *Kellerman* 4982 (GN) (distr. as *Viguiera helianthoides* HBK.). Hemsley's type (*Salvin & Godman* 133, in Kew Herb.) came from the Motagua Valley in Guatemala.

= = Leaves three-lobed, sessile, the upper reduced to lance-linear bracts; inflorescence few-headed, the peduncles very long.

21. S. **triloba** Blake, n. sp., verisimiliter herbacea; caule ad 1 m. alto tenui supra pauciramoso, ramis longissimis 1–3-capitulatis, utrisque purpureis substriatis glandulari-pubescentibus et praecipue in inflorescentia sparse pilosis; foliis inferioribus oppositis ovatis 1 cm. supra basin trilobatis, lobo medio 2.5–4 cm. longo alteris 1 cm. sive minoribus, omnibus oblongis subdentatis vel integris, sessilibus basi subamplexicaule 1 cm. longo latitudine medium lobum aequante, glandulari-scabris et praecipue supra hirsutis pilis basi tuberculatis; foliis superioribus oblongo-lanceolatis amplexicaulibus sensim ad bracteas ovatas vel lineares reductis; capitulis paucis longe pedunculatis pedunculis nudis vel pluribracteatis; disco 12–13 mm. alto 13–15 mm. diametro quam involucro paullo longiore; squamis circa triseriatis striatis glandulari-pubescentibus subhirsutis linear-subulatis exterioribus brevioribus; radiis ca. 10 flavis ovalibus 7.5 mm. longis

latis; corollis disci 6.5–7.5 mm. (tubulo 1 mm.) longis flavis denique apice purpurascentibus glandulosis praecipue in tubulo; acheniis maculosis appresse pubescentibus pilis ferrugineis 5–6 mm. longis 2.8–3 mm. latis; aristis 2, 4 mm. longis.

Specimens examined: PUEBLA: rocky soil, Cerro de Paxtle, Sept. 1908, *Purpus* 3022 (FGN, COTYPES). Distributed as *Encelia heterophylla* (= *S. foetida*), from which it differs in size of achene, leaf-base, and whole character.

+ + Rays purple.

22. S. SANGUINEA Gray. Stems several, erect from a woody root, 1 m. high or more, branched above, usually purplish, glandular-setose; lower leaves opposite, variable, hastately 3-lobed, with broadly margined cordate-clasping petiolar bases, crenate-dentate or sometimes cut-lobed, scabrous and glandular-setose both sides, 3–18.5 cm. long including petiole, about as wide across the lobes, the upper reduced to linear-lanceolate bracts; heads numerous, panicled, on peduncles 1–11 cm. long; disk 1–1.5 cm. high, mostly slightly surpassing the involucre; this 3-seried, the scales linear-subulate to lanceolate, striate, densely glandular, setose, the outer distinctly shorter; rays about 10, rich purple, oblong-oval, 6–10 mm. long; disk-corollas 5–8 mm. long, purple above, glandular-pubescent below, hairy on the teeth; pales 8.5–13 mm. long, narrow, glandular-pubescent toward the acute tip; achenes blackish, oval, barely obcordate, 4.5–6.5 mm. long, 2.5–3.5 mm. wide, more or less densely appressed-pubescent, bearing 2 teeth or 1 short smooth awn or 2 upwardly pubescent awns as much as 3 mm. long.

Simsia sanguinea Gray, Pl. Wright. i. 107 (1852).
Encelia sanguinea Hemsl. Biol. Centr.-Am. Bot. ii. 185 (1881).
Simsia erythranthema Sch. Bip. in Gray, Proc. Am. Acad. xix. 9 (1883), as syn.

Specimens examined: JALISCO: dry grassy slopes of the barranca near Guadalajara, 5 Nov. 1888, *Pringle* 1738 part (F: intermediate between this and the next); VERA CRUZ: hillsides, Chavarillo, 7 Sept. 1906, *Barnes, Chamberlain, & Land* 6 (F); Mirador, Consoquitla, Aug. 1841, *Liebmann* 492 (G); Mirador, without date, *Sartorius* (G); OAXACA: hills, Las Sedas, alt. 1830 m., 11 Aug. 1894, *Pringle* 5756 (G); El Parian, Etla, alt. 1200 m., Nov. 1898, *Conzatti & González* 899 (G); Santa Catarina, alt. 1000 m., 26 Dec. 1906, *Conzatti* 1652 (F); La Carbonera, alt. 2135 m., 20 Sept. 1895, *L. C. Smith* 817 (G); Monte Alban, alt. 1800 m., 18 Aug. 1897, *Conzatti & González* 403 (G);

valley of Oaxaca, alt. 1677–2287 m., 20 Sept. 1894, *Nelson* 1445 (N); same data, *Nelson* 1426 (GN). Temperate Mexico, without locality, mountains, *Ghiesbreght* 305 (TYPE in Gray Herb.).

22β. S. SANGUINEA Gray var. **Palmeri** (Gray) Blake, n. comb. Similar in size, habit, pubescence, and inflorescence; leaves ovate-lanceolate, acuminate, contracted below the middle to a clasping base, subentire or coarsely dentate, unlobed or slightly three-lobed; heads mostly 1.5 cm. high, the scales generally linear-lanceolate and fully equaling the disk; achenes variable as in the last as to pubescence and awns, sometimes quite glabrous; rays mostly paler, violet to pale purple.

Encelia (Simsia) sanguinea Hemsl. var. (?) *Palmeri* Gray in Wats. Proc. Am. Acad. xxii. 427 (1887).

Specimens examined: JALISCO: thickets on sides of cañons, Rio Blanco, Sept. 1886, *Palmer* 602 (GN, TYPE COLLECTION); barranca of Guadalajara, alt. 1372 m., 29 Sept. 1903, *Pringle* 11513 (FGN); dry grassy slopes of barranca near Guadalajara, 5 Nov. 1894, *Pringle* 1738 part (GN: intergrading with the species).

DOUBTFUL AND TRANSFERRED SPECIES.

Simsia canescens Gray, Pl. Fendl. 85 (1849) = GERAEA CANESCENS T. & G.

Simsia frutescens Gray in Torr. Bot. Mex. Bound. 89 (1859) = ENCELIA FRUTESCENS Gray.

Simsia ? heterophylla Pers. Syn. ii. 478 (1807) = IOSTEPHANE HETEROPHYLLA (Cav.) Benth.

Simsia hispida (HBK.) Cass. Dict. Sci. Nat. lix. 137 (1849). *Ximenesia hispida* HBK. Nov. Gen. iv. 227 (1820). *Encelia hispida* Hemsl. Biol. Centr.-Am. Bot. ii. 184 (1881). This species, with "foliis alternis, sessilibus, ovato-oblongis, obsolete serratis, supra piloso-, subtus sericeo-hispidis," and hispidulous stem three-flowered at apex, has not since been recognized. The description points to a poorly developed *S. foetida*.

Simsia pastoensis Triana, Ann. Sci. Nat. sér. 4. ix. 40 (1858), from Columbia, has not since been identified. It seems to be related to *S. pubescens* Triana and *S. Sodiroi* (Hieron.) Blake. The original description reads thus: "Suffrutex, ramis teretibus sparse molliter pilosis et inter pilos puberulo-glandulosis asperulis; foliis summis alternis et subbracteiformibus, inferioribus oppositis breviter petiolatis ovatis acutis serratis, supra sparse decumbenti-pilosis et glandu-

4 mm. loso-scabris, subtus secus nervos pilosis, inter nervos sparse pubescentibus, petiolo basi auriculato amplexicauli longeque pilis longiusculis villoso; involucri squamis lanceolatis, acutis, extus pilis longiusculis villoso-canescentibus, squamis exterioribus brevioribus; capitulis petiolatis [sic], corymbo laxo subpaniculato; acheniis decumbentipilosulis, margine alatis.

"Crescit prope *Ortega*, altitudine 1200 metr. in prov. Pasto."

Simsia scaposa Gray, Pl. Wright. ii. 88 (1853) = ENCELIA SCAPOSA Gray.

Errata.

Page 336, line 20; for *calliopisidea* read *calliopsidea.*
" 353, " 37; for + Heads larger, rays 2–4.5 cm. read + + Heads larger, rays 2–4.2 cm.

PLATE 1.

A. *Enceliopsis* (Gray) A. Nels. Figures 1, 2, 3, 4, 5, 6, whole plant, head, disk-floret, achene, pale, and style-tip of *E. nudicaulis* (Gray) A. Nels. Figure 1 is from a cotype of *E. tuta* A. Nels.

B. *Geraea* Torr. & Gray. Figures 1, 2, 3, 4, 5, 6, whole plant, head, disk-flower, achene, pale, and style-branches of *G. canescens* T. & G.

C. *Encelia* Adans. Fig. 1, portion of plant of *E. californica* Nutt. Figures 2, 3, 4, 5, 6, head, disk-floret, achene, pale, and style-tip of *E. farinosa* Gray.

D. *Simsia* Pers. Figures 1, 3, 4, 5, 6, whole plant, disk-floret, achene, pale, and style-tip of *S. foetida* (Cav.) Blake. Fig. 2, head of *S. exaristata* Gray.

S. F. Blake, del.

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Presented by B. L. Robinson, May 14, 1913. Received June 24, 1913.

I. A GENERIC KEY TO THE COMPOSITAE–EUPATORIEAE.

By B. L. Robinson.

It is now more than twenty years since the genera of the *Eupatorium* tribe were keyed by Hoffmann in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5 (1890). During this interval several genera have been added to the tribe, some few have been definitely removed from it to other tribes of the *Compositae*, two (*Brachyandra* and *Addisonia*) have been reduced, and certain sections of genera have come to appear worthy of generic rank within the tribe. In consequence the key of Hoffmann, though excellent for its time, is now unsatisfactory and far from complete. The one here offered, though drawn up after some years' study of the group, is put forth rather as a convenient working hypothesis than a finished or monographic product.

In the *Eupatorium* tribe, as elsewhere in the *Compositae*, generic distinctions, though essential for classification, often seem pretty artificial and the more precisely they are stated the greater of necessity becomes the artificial or arbitrary element. A re-examination of the technical characters relied upon by the older authors discloses many exceptions and transitions. On the other hand persistent attempts to secure a more natural classification by relying in larger measure upon habital traits have proved even more disappointing. These, while fairly convincing among plants of a circumscribed area, quickly lose any statable definiteness in dealing with the species of the world. One is in consequence forced to a restatement of the distinctions of pappus, achenes, anther-tips, and involucral-bracts as yielding after all the most practical basis for classification in the group.

In order to employ these more technical features effectively some explanation and definitions are necessary.

The pappus of the *Eupatorium* tribe offers a wide variety, including nearly all forms found in the *Compositae*. Scales, distinct or connate,

blunt or bristle-tipped, as well as hairs truly capillary or setiform or awn-like, simple, barbellate, or plumose, rarely clavate or even gland-tipped, all occur within the tribe.

With rare exceptions it has been found possible to distinguish pretty readily between the truly capillary pappus of such genera as *Eupatorium*, *Mikania*, or *Brickellia* and the also terete but stiffer bristle-formed pappus characteristic of *Agrianthus* and of certain species to be segregated from *Ageratum*. On the other hand it is believed that this bristle-formed pappus can in practically all cases be distinguished from the scale-pappus of the true Ageratums and that it forms a useful basis of separation for some elements long classified with *Ageratum*. More difficult is the sharp distinction of plumose pappus from forms in which the setae are merely barbellate, and while this traditional character seems almost necessary at times it has been employed as sparingly as possible.

A distinction which is more important and which seems never to have been adequately studied even by close students of the *Compositae* is the difference between a very short cup-shaped, saucer-shaped, or coroniform pappus, such as occurs in *Ageratum* § *Coelestina*, and the similar low and often slightly angulate or toothed annulus which often crowns the mature achene in genera like *Alomia*, which lack all true pappus. When seen on fully ripe achenes from which the corolla has fallen away these structures often appear considerably alike, yet even in this late stage differences are usually to be noted. The true pappus, even when very rudimentary, inclines to be cup-shaped and possesses a thin edge. The annulus is a mere low usually thickish cartilagineous or fleshy ring with a blunt edge. If examined in a younger stage, while the corolla is still in place, it will be seen that the true pappus, however rudimentary, is distinctly exterior to the base of the corolla, while the annulus is merely the ringlike base from which the mature corolla disarticulates. This base sometimes enlarges slightly after the corolla falls and has in such species as *Ageratum echioides* or more properly *Alomia echioides* been taken for a true and much reduced pappus. In the peculiar genus *Jaliscoa* the annulus takes on a saucer shape and has frayed quasi ciliolate edge, yet when carefully examined in a young state it can be seen to be a sub-corollar rather than an extra-corollar structure.

To add to the complexity an intra-corollar disk is often present in various rudimentary forms, as for instance in minute fleshy or glandular papillae or in a fleshy ovoid, depressed-globose, or napiform enlargement at the base of the style, capable of some persistence in the mature achene.

The presence or absence of a true (though often much reduced) pappus becomes especially important in distinguishing *Ageratum* § *Coelestina* and *Alomia* and leads, as will be seen elsewhere in this paper, to some readjustment of generic lines. The character is believed to be a good one and to lead to a real distinction between groups which have hitherto been very poorly delimited.

To see clearly what is here meant it is only necessary to compare *Ageratum micropappum*, possessing a true but excessively reduced pappus, with *Ageratum heterolepis*, *A. echioides*, *A. microcephalum*, or *A. microcarpum*, all of which so far as observed by the writer have no real pappus but merely a sub-corollar annulus and in consequence are to be referred to *Alomia*.

The involucre in the *Eupatorium* tribe takes on many forms, all more or less intergrading. In *Eupatorium* itself, though the involucre goes through the whole gamut of variation, the number of species is so great that grouping by involucral differences has never appeared to be sharp enough to permit any satisfactory generic segregation of the elements concerned. It is very easy to refer certain marked species to *Osmia* Sch. Bip. and others to *Kyrstenia* Necker, but transitions are innumerable. On the other hand in many of the smaller genera involucral characters furnish distinctions of sectional or even generic value. Three types of involucre may be recognized as follows: 1) in which the chief scales are definite or subdefinite in number (four in *Mikania* and *Kanimia*, five or six in *Stevia*) often surrounded at the base by 1–3 considerably reduced scales i. e. calyculate. 2) the chief scales of indefinite number (though rarely very numerous) and subequal, appearing to be in 1–3 series and often accompanied by a very few much reduced outer ones. This is the common form of involucre in *Ageratum*, *Kuhnia*, etc. 3) scales of indefinite number (usually numerous) conspicuously unequal and gradually diminishing outward, forming apparently several to many series, though of course in reality spirally arranged. These three types of involucre, while sometimes confluent, are in general pretty readily distinguished.

There are also considerable differences in the texture of the involucral scales and to some extent these may be used, at least as supplementary aids, in distinguishing genera. Thus in *Ageratum*, most Alomias, and several other genera the scales are prevailingly of rather firm texture and pretty definitely 1–3-costate, while in *Brickellia*, *Hofmeisteria*, *Podophania*, *Oaxacania*, etc. the scales are prevailingly thin, flat, and finely striate.

One other character of special classificatory significance in the

Eupatorium tribe needs restatement with greater detail, namely the apical appendage of the anthers. It has long been customary to separate the subtribe *Piquerinae* on the ground that this apical appendage was there absent, yet to this subtribe have been referred several genera, such as *Adenostemma*, *Gymnocoronis*, *Harturightia*, *Podophania*, *Decachaeta*, *Helogyne*, and *Eupatoriopsis*, which exhibit such an apical appendage in various degrees of development, while in *Eupatorium* proper there are several species in which the appendage is decidedly rudimentary. It will thus be seen that the distinction between the *Piquerinae* and the *Ageratinae* breaks down completely unless it can be supplemented by other characters or restated with proper qualification. Persistent search has failed to discover any correlated differences, so it is necessary to make the most of the anther-appendage.

Examination of the typical *Piquerinae*, such as *Piqueria*, *Ophryosporus*, etc., shows that the anthers are entirely destitute of apical appendage, nor is the connective upwardly thickened or expanded in a way to cover the cells. If, however, the doubtful genera above mentioned are examined, it becomes evident that the rudimentary appendage assumes several distinguishable forms. In *Decachaeta* and *Podophania* it consists merely of an exceedingly short cushion-like expansion of the dilated summit of the connective. The connective is thus without change of texture broadened out until it partially or entirely covers the apices of the loculi, the whole anther being decidedly blunt or even slightly retuse. It is to be noted that there is here no membranaceous appendage in the stricter sense, and it seems best to retain these genera in the *Piquerinae*.

The next stage in the development of the apical appendage is seen in the three genera *Adenostemma*, *Gymnocoronis*, and *Harturightia*. In these there appears always to be at least a very short and decidedly retuse membranous appendage. This may be a single or simple structure or in *Adenostemma* it is sometimes so deeply divided in the middle that it virtually becomes two small membranous tips crowning and slightly prolonging the two loculi. In other respects these three genera manifest striking similarities, such as the form of the corolla and especially in the uniformly glandular faces of the achenes. Both on account of the seemingly close relationship among themselves and in order to permit a more precise definition of the *Piquerinae* it seems desirable to class these three genera in a new co-ordinate subtribe, the *Adenostemmatinae*.

In *Helogyne* and *Eupatoriopsis* the apical appendage assumes the

ovate-oblong form, fairly characteristic of other portions of the *Eupatorium* tribe, and these genera may well be transferred to the *Ageratinae* as has been earlier pointed out. See Proc. Am. Acad. xlii. 27 (1906). With these changes it is believed that the *Piquerinae*, *Adenostemmatinae*, and *Ageratinae* will be found fairly clear as subtribes. The fourth subtribe of the *Eupatoricae*, characterized by its more numerously ribbed achenes, has been known as the *Adenostylinae* from its (as assumed) typical genus, *Adenostyles* Cass. This genus, however, is one which has always been very dubiously placed with the *Eupatoricae* if classed with them at all. To the writer, after repeated examinations of the genus from various points of view, it seems clear that its real affinity is with the *Senecioneae*. Arguments for this view can be found in many minor details of habit, which taken together become convincing. The elongated style-branches alone would suggest a relationship with the *Eupatoricae*, but even these do not appear really eupatorioid. They tend to an attenuate rather than a clavellate form in the first place, and in the second they are inclined to be recoiled through a much greater arc than is usual among the *Eupatoricae*. Finally the unbranched portion of the style in *Adenostyles* is at maturity commonly exserted, while this would in the *Eupatorium* tribe be highly exceptional. With the removal from the *Eupatorium* tribe of the genus *Adenostyles* the remaining portion of the subtribe hitherto known as the *Adenostylinae* must in accordance with Art. 52 of the International Rules of Botanical Nomenclature be renamed. It may be called the *Kuhniinae*.

The genus *Mallinoa* Coult. Bot. Gaz. xx. 47 (1895) was doubtfully ascribed by its author to the *Inuleae*, its anthers being described as sagittate and being figured (l. c. t. 5, f. 4) as having acute auricles at the base of the anther-cells. Soon after its publication Hoffmann in Engl. & Prantl, Nat. Pflanzenf. Nachtr. 322 (1897) placed *Mallinoa* in the *Eupatoricae*, where there can be no doubt it in reality belongs. For some reason not made clear, Hoffmann, though recognizing the eupatorioid nature of *Mallinoa* placed it next *Trichogonia*, with which it has no close habital resemblance nor striking likeness of involucre or pappus. To the writer *Mallinoa* seems to be merely a species of the genus *Eupatorium*, exceedingly close to the long known *E. bellidifolium* Benth. In foliage, gesture, and inflorescence these plants possess a resemblance amounting almost to identity. *Mallinoa*, however, is readily distinguished (specifically) by its decidedly broader, blunter, and much smoother involucral bracts. In the light of excellent material of both plants secured by Mr.

Pringle, the writer finds that the anther-bases in *Mallinoa* are cordate rather than sagittate, the basal auricles being decidely rounded. In *Eupatorium bellidifolium* furthermore the anther-bases are also retuse, the condition being very similar and the difference merely a trifling one of degree and in no sense one of kind. The degree of difference is closely comparable to that shown between fig. 2 and fig. 3 on plate 9 of Bentham's classical "Notes" (Jour. Linn. Soc. xiii.). It will be noticed that Bentham, whose experience and judgment upon these matters have probably never been surpassed, admits the occurrence of anthers of both these types in the *Eupatorium* tribe (l. c. 360). If admitted to the *Eupatorium* tribe at all, *Mallinoa* cannot be kept out of the genus *Eupatorium* as at present delimited.

Regarding the transfer of *Apodocephala* Bak. to the *Vernonieae*, see Proc. Am. Acad. xlii. 32 (1906), and of *Lepidesmia* Klatt to the *Helianthеae*, see Proc. Am. Acad. xlvii. 210 (1911).

Further study, especially of the larger genera, may well reveal profitable generic segregations not as yet clear. This is especially likely to be the case among the numerous and as yet very imperfectly known South American members of the tribe. It is also by no means improbable that when these are more satisfactorily represented in herbaria some new and more convincingly natural re-adjustment of generic lines will become possible. Furthermore, it is to be remembered by users of the following key that disconcerting exceptions and anomalies occur here as elsewhere among the *Compositae*, as for instance four-, six-, or even seven-angled achenes among the normally 5-angled ones in the *Ageratinae*, or occasionally calvous achenes in certain heads of the normally pappus-bearing genera *Trichogonia* and *Ageratum*.

Subtr. I. Piquerinae. Antherae apice omnino exappendiculatae vel a connectivo sursum leviter incrassato et supra loculos plus minusve lateraliter expanso truncato vel retuso terminatae. Achaenia non glandulari-papillifera.

a. Pappus nullus vel rarissime brevissime obsoleteque setosus. . 1. *Piqueria*
a. Pappus setosus *b.*
  b. Pappi setae laeves vel modice scabratae *c.*
    c. Pappi setae saepissime 10 sursum clavellatae. Folia pleraque alterna 3-lobata vel non lobata. Capitula parva numerosa subsessilia paniculata. . . . . 2. *Decachaeta.*
    c. Pappi setae tenues non clavellatae. Folia opposita dissecta. Capitula axillaria longe pedunculata. . . . . 3. *Podophania.*
  b. Pappi setae plumosae. . . . . 4. *Ophryosporus.*

a. Pappus squamosus *d.*
  d. Pappi squamulae breves fimbriatae. Ind. Occ. ..... 5. *Phania.*
  d. Pappi squamulae longae integrae apice in aristam attenuatae. Mex. ..... 6. *Ageratella.*

Subtr. II. **Adenostemmatinae**, subtr. nov. Antherae apice breviter appendiculatae, appendice membranacea aut simplici et retusa aut bifida et apices loculorum coronante. Corollae tubus brevis et fauces infundibulares. Achaenia obovoidea glandulari-papillosa.

a. Pappus e setis brevibus 3–5 clavatis ab annulo patentim ascendentibus compositus ..... 7. *Adenostemma.*
a. Pappus nullus vel brevissime obsoleteque setosis, setulis numquam clavatis *b.*
  b. Receptaculum nudum. Folia opposita dentata. Mex., Am. Aust. 8. *Gymnocoronis.*
  b. Receptaculum margine paleiferum. Folia alterna integra. Fla. 9. *Hartwrightia.*

Subtr. III. Ageratinae. Antherae apice cum appendice membranacea ovata vel oblonga integra vel retusa instructae. Achaenia normaliter 5(rarissime 4–6)-angulata prismatica vel subprismatica rariter compressa eglandularia vel rariter glandulari-atomifera.

a. Pappus e squamis distinctis vel basi connatis aut ex aristis deorsum squamiforme expansis aut ex aristis et squamellis aut e corona dentata vel fimbriata vel integra compositus aut omnino deficiens *b.*
  b. Involucri squamae 5–6 uniseriales subaequales cum vel absque 1–3 squamulis extimis multo brevioribus ..... 10. *Stevia.*
  b. Involucri squamae ∞ saepius numerosa 2–∞-seriatae *c.*
    c. Pappus evolutus e squamis aut distinctis tenuibus vel rare indurescentibus aut in cupulam coroniformem tenuem scariosam dentatam vel integram connatis compositus rarissime (apud *Ageratum* spp.) obsoletus *d.*
      d. Involucri squamae valde inaequales ∞-seriatim imbricatae *e.*
        e. Pappus coronam crateriformem margine laciniatam formans. Folia bipinnatifida. Bras. ..... 11. *Lomatozona.*
      e. Pappus e squamulis brevibus obovatis vel oblongis obtusis compositus *f.*
        f. Receptaculum pilosiusculum. Pappi paleae apicem versus denticulatae. Folia penninervia. Bras. ..... 12. *Carelia.*
        f. Receptaculum paleaceum. Pappi paleae breviter fimbriatae. Folia 3-nervia. Mex. ..... 13. *Aschenbornia.*
      e. Pappus ex aristis cum squamulis alternantibus aut ex aristis basi squamiforme dilatatis compositus *g.*
        g. Folia sessilia linearia subintegra. Herba annua. Calif. infer. ..... 14. *Malperia.*
        g. Folia longiuscule petiolata dentata vel lobata vel dissecta. Frutices vel suffrutices. ..... 15. *Hofmeisteria.*
    d. Involucri squamae subaequales 2–3-seriales cum vel absque squamulis 1–3 extimis multo brevioribus *h.*
      h. Pappi squamae distincte indurescentes. Folia verticillata. Am. Bor. atlant. ..... 16. *Sclerolepis.*

h. Pappus tenuis non indurescens. Folia opposita vel alterna *i.*

i. Corollae tubus bene distinctus subfiliformis in fauces discrepitante ampliatas campanulatas subito transiens. Folia subcoriacea. Suffrutices. Mex. . . 17. *Oxylobus.*

i. Corollae tubus saepissime brevis, faucibus vix distinctis vel solum modice ampliatis. Folia membranacea. . . . . 18. *Ageratum.*

c. Pappus verus nullus, achaeniis tamen cum annulo sub corolla numquam extra corollam orienti coronatis *j.*

j. Achaenia 4–5-angulata. Involucrum non foliaceum *k.*

k. Achaenia prismatica *l.*

l. Herbae vel frutices non repentes. . . . . 19. *Alomia.*

l. Herba repens. Columbia. . . . . 20. *Tuberostyles.*

l. Frutex. Caulis fistulosus et maturitate clathratus. Mex. 21. *Jaliscoa.*

k. Achaenia compressiuscula. Frutex, foliis alternis suborbicularibus sinuato-lobulatis. Mex. . . . . 22. *Oaxacania.*

j. Achaenia 6-angulata. Involucri squamae exteriores subfoliaceae. Bras. . . . . 23. *Planaltoa.*

a. Pappus setosus, setis capillaribus vel firmiusculis, liberis vel basi in annulum coalitis *m.*

m. Pappi setae plumosae *n.*

n. Achaenia compressa. Pappi setae brevissimae. Bras. 24. *Eupatoriopsis.*

n. Achaenia prismatica *o.*

o. Pappi setae firmiusculae saepissime breves non rite capillares *p.*

p. Capitula sessilia. Folia squamiformia imbricata 25. *Agrianthus.*

p. Capitula pedicellata. Folia cum lamina normali 27. *Trichogonia?* [1]

o. Pappi setae capillares plumosae *q.*

q. Corollae fauces subcampanulatae a tubo proprio differentiatae 27. *Trichogonia.*

q. Corolla graciliter tubulata sine faucibus distinctis *r.*

r. Folia alterna. Frutices xerophyticae. Am. Aust. occ. 28. *Hologyne.*

r. Folia opposita. Herba. Am. Bor. aust.-occ. et Mex. 29. *Carminatia.*

m. Pappi setae capillares simplices laeves vel modice scabratae *s.*

s. Achaenia valde compressa. Pappi setae 2. Mex. 30. *Schaetzellia.*

s. Achaenia prismatica. Pappi setae 5–∞ *t.*

t. Pappi setae longitudine valde conspicueque inaequales. Am. Aust. 31. *Dissothrix.*

t. Pappus uniformis vel subaequalis *u.*

u. Pappi setae brevissimae paucae longitudine crassitiem achaenii vix aequantes. . . . . 32. *Trichocoronis.*

u. Pappi setae achaenii longitudinem subaequantes *v.*

v. Pappi setae caducae *w.*

w. Involucri squamae valde inaequales ∞-seriatim imbricatae. Folia opposita. Mex. . . . . 33. *Piptothrix.*

w. Involucri squamae subaequilongae ca. 2–3-seriatim laxe imbricatae. Folia alterna. Bras. . . . . 34. *Leptoclinium*

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1 Hic expeterentur species quaedam adhuc dubiae ex *Agerato* ob pappo setiformi expulsae et ad *Trichogoniam* valde approximantes.

v. Pappus persistens *x*.
  x. Pappi setae basi in annulum crassiusculum coalitae. Folia coriacea. Bras.....35. *Symphyopappus*.
  x. Pappi setae basi liberae vel levissime inconspicueque coalitae. Folia saepissime membranacea *y*.
    y. Involucri squamae ut flosculi ∝ *z*.
      z. Pappi setae subdefinitae saepissime 5. 36. *Fleischmannia*.
      z. Pappi setae ∞ numerosae. Receptaculum nudum vel obscure setiferum.....37. *Eupatorium*.
      z. Pappi setae ∞ numerosae. Receptaculum paleiferum. Folia magna. Mex.....38. *Eupatoriastrum*.
    y. Involucri squamae definitae 4. Flosculi etiam 4. Herbae vel frutices saepissime volubiles. .39. *Mikania*.

Subtr. IV. **Kuhniinae**, nom. nov. Antherae apice cum appendice membranacea ovata vel oblonga munitae. Achaenia 10–20 (rariter 6–9)-costata.— *Adenostylinae* auct. excl. *Adenostyle* genere ipsissimo nominiferente.

a. Involucri squamae definitae 4. Flosculi etiam 4.....40. *Kanimia*.
a. Involucri squamae ∞ saepissime numerosae *b*.
  b. Pappus setosus *c*.
    c. Receptaculum nudum *d*.
      d. Achaenia compressa. Foliorum dentes saepissime setiferae. Mex. 41. *Barroetea*.
      d. Achaenia prismatica vel teretia *e*.
        e. Involucri squamae valde inaequales pluriseriatim imbricatae *f*.
          f. Involucri squamae tenues striatae vix herbaceae. Pappi setae uniseriatae laeves vel barbulatae. Folia opposita vel alterna 42. *Brickellia*.
          f. Involucri squamae herbaceae vel coloratae vel scariosae non conspicue striatae. Pappi setae uniseriatae saepissime plumosae rariter barbulatae. Herbae perennes, caule saepius simplici basi tuberoso.....43. *Liatris*.
          f. Involucri squamae herbaceae. Pappi setae 2–3-seriatae, exterioribus brevioribus. Frutex foliis alternis obovatis. Fla. 44. *Garbera*.
        e. Involucri squamae subaequales 2–3-seriatae. Folia saepissime alterna *g*.
          g. Pappi setae capillares conspicue plumosae....45. *Kuhnia*.
          g. Pappi setae firmiusculae vix barbulatae.....46. *Trilisa*.
    c. Receptaculum paleiferum. Folia alterna.....47. *Carphephorus*.
  b. Pappus ex aristis basi squamiforme dilatatis compositus. Folia opposita. Am. Bor. aust.-occ. et Mex.....48. *Carphochaete*.

II. REVISIONS OF ALOMIA, AGERATUM, AND OXYLOBUS.

By B. L. Robinson.

The following treatment has been based chiefly upon an intensive study of the pertinent material in the Gray Herbarium, but much aid has been derived from a series of photographs, taken at various European herbaria in 1905 and 1910, representing the types of nearly all the recognized species of *Alomia* and *Ageratum* not originally described from the Gray Herbarium. There has been no opportunity to test the keys and descriptions by a re-examination of the extensive material in foreign collections, but through the kindness of Messrs. Coville and Maxon the writer has been permitted to borrow and study the representation of *Alomia* and *Ageratum* from the National Museum at Washington, a considerable privilege for which he would express grateful appreciation. The writer is also much indebted to Mr. John Donnell Smith for the loan of *Ageratum* and *Alomia* from his rich personal herbarium, and to Mr. A. B. Rendle of the British Museum of Natural History for the critical comparison establishing beyond doubt the identity of *Ageratum Houstonianum* Mill. Miss M. A. Day and Miss E. M. Vincent of the Gray Herbarium staff have given bibliographical aid.

It may be said in a general way that the species of these genera do not tend to serious intergradation, except in the case of *Ageratum conyzoides* L. and *A. latifolium* Cav. (not Hemsl.), where separation though easily made seems pretty artificial, and on the other hand the several species which are closely allied to the highly variable *A. corymbosum* Zuccag. and are distinguished chiefly by such characters as leaf-contour, pubescence, etc.

It must be frankly admitted that the treatment of the South American species is very sketchy, being derived from wholly inadequate material. It is highly probable that further exploration of northern South America and of Brazil will bring to light many further species, and perhaps considerably modify our present views as to the distinctness of those already known.

1. Revision of the Genus Alomia.

The tropical American genus *Alomia* is a convenient rather than a convincingly natural group of species. Depending for its separation

from *Ageratum* and *Trichogonia* solely on the absence of pappus, the genus may well have a composite — at least a double — origin. Either a *Trichogonia*, on the loss of its plumose pappus-bristles (a condition known to occur in *T. menthaefolia* and *T. salviaefolia* Gardn.), or an *Ageratum*, on the complete abortion of its often obsolescent scale-pappus, would become as to technical characters an *Alomia*, and the fact that the genus *Alomia*, as now circumscribed, contains species of a wide range of habit, extending on the one hand from the original *A. ageratoides*, with distinctly ageratoid habit, to *A. dubia*, on the other, which except for the lack of pappus would certainly be placed in *Trichogonia*, it appears by no means unlikely that the elements now grouped in *Alomia* may have come in part from an ageratoid and in part from a *Trichogonia*-like ancestry.

Although from these considerations *Alomia* may seem an artificial group, its components certainly have close affinity and our present knowledge does not permit any improvement of the situation either by dividing the genus on trifling traits of habit or by merging it bodily with any of the neighboring genera.

The three species here grouped as a new subgenus, *Geissanthodium*, possessing softer much imbricated involucral scales (striate in the manner of *Brickellia*), form an interesting strain, a small presumably natural group. After careful comparison of *A. alata* Hemsl. and *Ageratum callosum* Wats. it is impossible to see any grounds for their generic separation. Either *Ageratum callosum* must be referred to *Alomia* or the genus *Alomia* must be transferred to *Ageratum*. The close relationship of the third species of this subgenus, the South American *A. Regnellii* Malme, although less convincing, seems highly probable to judge from Malme's description and figures. Some specious arguments might be advanced for the separation of these three species as a new genus, but their distinctions from other species of *Alomia* are not strong. Involucral characters in nearly related genera are seen to be highly inconsistent and it is to be noticed that the imbrication of the scales is by no means so striking in the Brazilian *A. Regnellii* as in the Mexican species. Nor is the undifferentiated corolla-tube a strong character. It seems best therefore to treat the group merely as a subgenus.

Alomia tenuifolia (the genus *Lycapsus* of Philippi), a xerophytic shrub confined to a small island off the coast of Chili, is still obscure. It does not appear to be represented in the leading European or North American herbaria. Bentham, judging it merely by the description and crabbed little figures of Philippi, placed it in *Alomia*.

This may be its real affinity, but it is to be noted that Philippi represents the style-branches as being recoiled through more than 360°. This would be highly exceptional in the *Eupatorieae*. Furthermore, the style-branches as shown in Philippi's figures are unusually short for the tribe. Until material of this rare and local plant can be obtained and subjected to further study the species would better be left here, where Bentham placed it, but it would seem almost as likely to prove one of the *Heliantheae*, perhaps near *Isocarpha*.

As explained elsewhere in this paper, the rudimentary annular or coroniform "pappus," accredited in the past to several species hitherto placed in *Ageratum*, proves not to be a true pappus, i. e. a calycular structure exterior to the corolla, but only an annulus upon which the corolla itself is borne and which after the disarticulation and fall of the corolla sometimes is slightly accrescent. These species, destitute of a true pappus, must certainly be transferred to *Alomia* if that genus is to be kept distinct from *Ageratum* and they are so treated in the following revision.

While in nearly all of the species concerned the presence or absence of a pappus is upon careful observation sufficiently evident and constant to permit a pretty ready separation of species into those which should be referred to *Alomia* on the one hand and those which would better be placed in *Ageratum* on the other, there are two exceptional species, *Ageratum littorale* Gray and *A. maritimum* HBK., in which the distinction breaks down absolutely. Here the pappus may be entirely wanting, it may consist of minute teeth, very short and slightly exterior to the corolla, or finally it may develop into a perfectly definite and conspicuous scale-pappus. These marked variations in pappus occur in individuals of precisely similar habit, and so far as can be ascertained are accompanied by no concomitant changes of structure. This wide intra-specific variation presents, of course, a technical difficulty in delimiting the genera *Ageratum* and *Alomia*. However, it is to be remembered that calvous forms in normally pappus-bearing *Compositae* are by no means rare and must be accepted as one of the inherent difficulties of the group. It would be highly artificial to transfer to *Alomia* the calvous forms of *Ageratum littorale* and *A. maritimum*, nor does it seem best to unite with the otherwise consistently pappus-bearing genus *Ageratum* the consistently calvous genus *Alomia* because in certain exceptional species an abortion of the pappus occurs inconstantly, as it does also in *Trichogonia menthaefolia* Gardn., *Calea peduncularis* HBK., and various other *Compositae* in which the loss of pappus can in no sense be regarded as having generic significance.

Alomia was confused by Gardner with *Piqueria* and *Gymnocoronis*, but may be readily distinguished by its apically appendaged anthers. *Orsinia* Bert., associated with his *Piqueria* § *Eupiqueria* by Gardner in Hook. Lond. Jour. Bot. vi. 430 (1847), and with *Alomia* by Baker in Mart. Fl. Bras. vi. pt. 2, 189 (1876), and even by Dalla Torre & Harms, Gen. Siph. 526 (1905), is a *Clibadium*, as was indicated by Bentham, Gen. ii. 240 (1873).

ALOMIA HBK. (Nomen ex *ἀ* privativo et *λῶμα*, *margo*, defectionem pappi alludens.) Capitula homogama parva vel mediocra saepe numerosa laxe paniculata vel in apicibus ramorum corymbulosa 20–70-flora; involucri campanulati vel subturbinati squamis vel subaequalibus ca. 2-seriatim imbricatis lanceolato-linearibus saepissime acutis 1–3-costatis firmiusculis vel valde inaequalibus 3–∞-seriatim imbricatis tenuioribus striatulis; receptaculo plano vel conico nudo vel plus minusve paleifero, paleis saepe angustis. Corollae albae vel roseae vel purpureae saepissime extus glandulis subsessilibus conspersae rarius in tubo vel limbo hirsutae vel tomentosae rarissime glabrae. Antherae oblongae apice appendiculatae basi rotundatae haud rarenter vix connatae. Styli rami filiformi-clavellati purpurei vel flavi vel aurei rectiusculi vel leviter recurvantes vel per exceptionem (Subg. 3) spiraliter recurvati. Achaenia prismatica 5-angularia glanduloso-atomifera vel hispidula vel glabra fusca vel nigrescentia basi callosa apice annulo cartilagineo vel carnoso integerrimo vel angulato conspicuo vel tenuissimo vel omnino obsoleto coronata; pappo nullo.— Nov. Gen. et Spec. iv. 151, 312, t. 354 (1820); Cass. Dict. Sci. Nat. xxvi. 227 (1823); Less. Syn. Comp. 154 (1832); DC. Prod. v. 105 (1836); Endl. Gen. 366 (1838); Benth. & Hook. f. Gen. ii. 240 (1873); Pfeiff. Nom. i. 116 (1873); Hoffm. in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5, 135 (1890); Dalla Torre & Harms, Gen. Siph. 526 (1905), excl. syn. *Orsinia*. *Piqueria* sect. *Alomia* (HBK.) Gardn. in Hook. Lond. Jour. Bot. vi. 430 (1847), excl. spp. *attenuata*, *eupatorioides*, *latifolia*, *subcordata;* Walp. Ann. i. 393 (1848), ex parte. *Lycapsus* Phil. Bot. Zeit. xxviii. 499, t. 8 (1870). *Adenostemma* sect. *Alomia* Baill. Hist. Pl. viii. 131 (1882).— Herbae annuae vel perennes vel suffrutescentes rarissime frutices. Folia ovata vel rhomboidea vel lanceolata vel linearia pleraque serrata vel dentata rarius integriuscula rarissime profunde pinnatifida. Inflorescentia corymbosa vel paniculata. Habitus *Ageratii* aut *Trichogoniae*. Species 12 quarum 3 mexicanae, 1 (ulterius inquirenda) insulam chilensem incolens, ceterae Brasiliam centrali-meridionalem habitantes.

Clavis subgenerum.

Involucri squamae 3–∞-seriatim imbricatae tenues striatulae. Corolla in tubum proprium et fauces distinctas non differentiata. Herbae
Subg. 1. GEISSANTHODIUM.
Involucri squamae ca. 2-seriatim (apud *A. heterolepidem* pluriseriatim) imbricatae saepius firmiusculae 1–3-costatae. Corolla cum tubo proprio graciliore definito et faucibus plus minusve ampliatis.
Styli rami rectiusculi vel modice recurvantes. Folia numquam profunde pinnatifida.....Subg. 2. EUALOMIA.
Styli rami spiraliter recurvati. Folia pinnatifida lobis linearibus
Subg. 3. LYCAPSUS.

Subg. 1. **Geissanthodium**, subg. nov. (Nomen ex *γεῖσσον, protectum* sensu imbricatum, et *anthodium* i. e. involucrum, ab *ἀνθώδης*, derivatum.) Involucri squamae (more earum *Brickelliae*) multiseriatim imbricatae tenues virides aut purpurascentes saepe tenuiter albido-striatae, exteriores gradatim breviores. Corollae graciliter tubulatae, tubo proprio haud discreto, faucibus distinctis nullis, limbo brevi quinquifido. Styli rami filiformi-clavellati rectiusculi vel leviter curvati saepissime flavi vel aurei. Achaenia per coronam carnosam albidam integerrimam coronata.— Herbae nunc perennes nunc veri-similiter annuae pubescentes. Folia longiuscule petiolata saltim inferiora opposita superiora saepius alterna. Species 2 calciphilae mexicanae necnon 1 brasiliana.

Clavis specierum.

Folia crenato-serrata. Species mexicanae.
Caulis glanduloso-puberulus nec longius pilosus. Petioli sursum anguste alati. Folia late cordata.....1. *A. alata.*
Caulis glanduloso-puberulus et lanato-pilosus. Petioli exalati. Folia non cordata.....2. *A. callosa.*
Folia grosse inciseque dentata. Species brasiliana.....3. *A. Regnellii.*

1. A. ALATA Hemsl. herbacea perennis gracilis decumbens vel saepe a rupibus pendula laxe ramosa; caulibus 4–6 dm. longis teretibus striatulis tenuissime glanduloso-puberulis; foliis deltoideo-ovatis late cordatis crenato-serratis tenuibus utrinque viridibus supra leviter pubescentibus subtus praesertim in nerviis venisque pilosis 2.5–5.5 cm. longis 1.5–5 cm. latis, petiolis 1–7 cm. longis saepissime apicem versus anguste alatis; capitulis laxe et irregulariter corymboso-paniculatis, pedicellis filiformibus saepius brevibus; involucri turbinato-campanulati squamis lineari-lanceolatis viridibus vel purpurascentibus albido-striatulis apice attenuatis extimis puberulis ceteris glabriusculis; corollis 3.6 mm. longis graciliter tubulatis viridescenti-albis plus minusve atomiferis limbum brevissimum versus subconstrictis; achaeniis 2.2 mm. longis basi callosis apice annulo turgido carnoso coronatis a

glandulis subsessilibus sparse conspersis.— Biol. Cent.-Am. Bot. ii. 79 (1881).— MEXICO: in rupibus abruptis umbrosis vallicularum prope Cuernavacam, *Bourgeau*, n. 1216 (hb. Gray.), *Bilimek*, n. 579 f. Hemsl. l. c., *Pringle*, nn. 6229, 9846 (hb. Gray., hb. U. S. Nat. Mus.); Guadalupe, *Bilimek*, n. 488 (hb. Gray.).

2. **A. callosa** (Wats.), comb. nov., herbacea gracilis; caulibus teretibus saepe purpureo-brunneis brevissime glanduloso-puberulis et conspicue griseo-pilosis sublanatis quamquam aetate glabriusculis 3–6 dm. longis oppositirameis; foliis oppositis ovatis obtusiusculis vel acutis crenato-serratis basi obtusis vel subtruncatis 3-nerviis tenuibus utrinque laxe pubescentibus 2–6 cm. longis 1–4 cm. latis, petiolo 1–3 cm. longo exalato; capitulis laxe corymbosis; involucri campanulati squamis multiseriatim imbricatis anguste lanceolato-oblongis acutis mucronulatis erosis; corollis graciliter tubulatis a basi ad limbum sensim ampliatis sed sine faucibus ullis distinctis viridescenti-albis 3.2 mm. longis glandulis minutis subsessilibus conspersis; achaeniis 1.2 mm. longis atropurpureis in costis 5 glanduloso-puberulis apice coronam carnosam integerrimam crateriformem gerentibus.— *Ageratum callosum* Wats. Proc. Am. Acad. xxv. 153 (1889).— MEXICO: in rupibus humidis prope Guadalajaram, *Pringle*, nn. 2166 (hb. Gray.), alt. 1525 m., 4739 (hb. U. S. Nat. Mus., hb. J. D. Sm.), n. 9353 (hb. Gray., hb. U. S. Nat. Mus.).

3. A. REGNELLII Malme, herbacea perennis ad 3 dm. alta; caule tereti subsimplici molliter patentimque piloso et etiam glanduloso-puberulo; foliis oppositis vel superioribus alternis tenuibus deltoideis vel late ovatis glanduloso-pilosis usque ad 4.5 cm. longis et ad 4 cm. latis acutis grosse inciseque dentatis basi rotundatis vel ad insertionem petioli plus minusve cuneatis utrinque viridibus supra parce glandulosis vel glabriusculis subtus glandulosis et in nerviis molliter pilosis, petiolo 1.5–3 cm. longo; capitulis laxe cymosis ca. 40-floris, pedicellis bracteolisque glanduloso-puberulis, involucri campanulati squamis valde inaequalibus ovato-lanceolatis vel lanceolatis vel interioribus lineari-oblanceolatis viridibus pilosis apicem versus ciliatis; receptaculo plano nudo; corollis albis caerulescentibus ca. 3 mm. longis a basi ad limbum sensim ampliatis tubo extus intusque glabro sed dentibus limbi extus plus minusve pilosiusculis; achaeniis ca. 2.5 mm. longis subprismaticis vel graciliter turbinatis nigris nitidis glabris vel basi et sub apice pilis brevissimis paucis caducis munitis.— Kongl. Sv. Vet. Akad. Handl. xxxii. n. 5, 32, t. 2 (1899).— Brasiliae prov. MATTO GROSSO, in fissuris rupium praeruptarum, Serra da Chapada, Buriti, locos subumbrosos praesertim habitans, *Malme*, n. 1678. Sp. non visa, solum e descriptione et icone optimis cl. Malmei interpretata.

Subg. 2. **Eualomia**, subg. nov. Involucri squamae (more *Agerati* earum) subaequales saepissime firmiusculae 1–3-costatae. Corollae cum tubo proprio saepe brevi et faucibus plus minusve cylindraceis munitae. Styli rami filiformes vel leviter clavellati patente recurvati saepius purpurascentes. Achaenia ecoronata vel coronam tenuem cartilagineam integerrimam ferentia.— Herbae annuae vel perennes vel suffrutescentes. Folia rhomboideo-ovata vel lanceolata vel linearia. Species 9, quarum una mexicana est ceterae Brasiliam centrali-meridionalem incolunt.

Clavis specierum.

a. Receptaculum paleiferum *b.*
  b. Herbae annuae *c.*
    c. Folia anguste linearia. Capitula 8 mm. diametro. . . . . 4. *A. Pohlii.*
    c. Folia lanceolata. Capitula 5 mm. diametro. . . . . 5. *A. foliosa.*
  b. Herbae perennes vel frutices *d.*
    d. Paleae receptaculi apice obtusiusculae vel acutae saepius erosae vel pilosae numquam induratae *e.*
      e. Folia lineari-oblanceolata tenuia inciso-dentata 6. *A. fastigiata.*
      e. Folia late rhomboidea inciso-dentata submembranacea 7. *A. myriadenia.*
    e. Folia lanceolata vel oblonga, serrata vel integra, coriacea *f.*
      f. Capitula 6–8-flora. . . . . 8. *A. longifolia.*
      f. Capitula ca. 36-flora. . . . . 9. *A. heterolepis.*
    d. Paleae receptaculi apice subulato-attenuatae plus minusve induratae glabrae *g.*
      g. Caulis per fere totam longitudinem foliosus *h.*
        h. Folia subtus glandulis numerosissimis crebre punctata cum pilis sparsissimis vel nullis munita *i.*
          i. Involucri squamae costatae *j.*
            j. Involucri squamae glanduloso-atomiferae aliter glabrae lineares rigidiusculae. Folia lanceolata 10. *A. microcephala.*
            j. Involucri squamae fere eglandulosae sed sub lente conspicue pubescentes et ciliatae lanceolatae. Folia fere linearia. . . . . 11. *A. guatemalensis.*
          i. Involucri squamae planae latiusculae ovatae ecostatae 12. *A. platylepis.*
        h. Folia subtus velutino-pilosa. . . . . 13. *A. isocarphoides.*
      g. Caulis superne nudiusculus. Folia subtus pilosa 14. *A. echioides.*

a. Receptaculum nudum *k.*
  k. Folia angusta, linearia vel lanceolata vel oblanceolata *l.*
    l. Capitula 30–35-flora. Folia sublinearia. Pedicelli breves (3–4 mm. longi). Corolla ca. 2 mm. longa. . . . . 15. *A. cinerea.*
    l. Capitula ca. 65-flora. Folia oblanceolata. Pedicelli 6–8 mm. longi. Corolla ca. 4 mm. longa. . . . . 16. *A. dubia.*
  k. Folia latiora, cordato- vel rhomboideo-ovata *m.*
    m. Capitula laxe scorpioideo-cymosa patentim paniculata. Mex. 17. *A. ageratoides.*

m. Capitula dense corymbosa *n.*
n. Capitula 12–15-flora. Folia irregulariter grosse dentata. Annua. Bras. ..... 18. *A. angustata.*
n. Capitula 60–70-flora. Mex., Am. Cent., Venez. *o.*
o. Perennis. Corymbi laxi patentes planiusculi. Folia acute acuminata et serrata. Mex. ..... 19 *A. Wendlandii.*
o. Annua. Capitula in cymis congestis valde convexis vel subglobosis disposita. Folia crenata saepissime obtusa. Costa Rica et (dubitative) Venez. ..... 20. *A. microcarpa.*

4. A. Pohlii (Sch. Bip.) Bak., annua erecta vel ascendens parce ramosa; radice fibrosa; caule glabriusculo 3–4.5 dm. alto, ramis divergentibus pilosiusculis; foliis plerisque oppositis supremis solum alternis linearibus 4–7 cm. longis vix 2 mm. latis planis utrinque viridibus et pilosiusculis obscure arguteque serratis apice basique acutatis uninerviis; capitulis ca. 8 mm. diametro ca. 35-floris ad apices ramorum in corymbis parvis confertis graciliter pedicellatis; involucri subhemisphaerici squamis subaequalibus oblongis obtusis viridibus vel apicem versus purpureis extus glanduloso-puberulis margine et praesertim apice membranaceo expanso translucido conspicue ciliatis; receptaculo conico cum paleis angustissime oblanceolati-linearibus instructo; corollis 2.8 mm. longis subglabris vix basin versus cum glandulis paucis subsessilibus conspersis, tubo proprio vix ullo, faucibus fere ab apice achaenii ampliatis; achaeniis nigris saepe curvatis cum glandulis parce conspersis neque basi callosis nec apice annulo coronatis ca. 1.9 mm. longis.— Bak. in Mart. Fl. Bras. vi. pt. 2, 190 (1876). *Coelestina Pohlii* Sch. Bip. ex Bak. l. c.— Brasilia: "inter Manoël Souza et Mideroz," *Pohl*, n. 358 (hb. Berol., phot. et fragm. in hb. Gray.); Lagoa Santa prov. Minas Geraës, *Warming*.

5. A. foliosa (Gardn.) Benth. & Hook. f., annua 2–3 dm. alta decumbens vel suberecta griseo-pilosa vel subtomentosa; radice fibrosa; caule paucirameo foliosissimo; foliis parvis 3-nerviis 1.5–2 cm. vel ultra longis ca. 6 mm. latis lanceolatis vel oblongo-lanceolatis oppositis arcte sessilibus tenuibus apice basique acutis acute serratis utrinque griseo-pilosis; capitulis in apicibus ramorum paucis aggregatis parvis 5 mm. solum diametro; involucri hemisphaerici vel campanulati squamis subaequalibus biseriatis herbaceis oblongis griseo- vel praesertim ad apicem obtusum plus minusve translucidum purpurascenti-pilosis et ciliatis 2.8–3.4 mm. longis; receptaculo conico cum paleis parvis angustis deciduis instructo; corollis 2.5 mm. longis roseis vel pallide purpureis subglabris, dentibus limbi papillosis, tubo proprio vix ullo in fauces confestim ampliato; achaeniis nigris prismaticis parce glandulosis 1.8 mm. longis.— Gen. ii. 240 (1873); Bak. in Mart. Fl. Bras. vi. pt. 2, 190 (1876). *Isocarpha foliosa* Gardn. in

Hook. Lond. Jour. Bot. v. 457 (1846); Walp. Rep. vi. 703 (1847). *Piqueria foliosa* Gardn. l. c. vi. 432 (1847). *Emmallocalyx chamaedrifolius* Pohl ex Bak. l. c. (1876).— BRASILIA: prov. Minas Geraës ad ripas inundatas fluminis Urucuyae prope San Romão, *Gardner*, n. 4838; sine loco indicato, *Claussen*, *Pohl*, n. 669 (hb. Berol., phot. et fragm. in hb. Gray.); prov. Bahia ad Utinga, *Blanchet*, n. 2754, fide Bak. l. c.

6. A. FASTIGIATA (Gardn.) Benth., suffruticosa fastigiatim ramosa 4–9 dm. alta foliosissima; ramis gracilibus teretibus pallide brunnescentibus crispe puberulis vel glabriusculis; foliis oblanceolatis vel lineari-lanceolatis incise serratis vel integriusculis basi attenuatis apice acutatis vel attenuatis utrinque viridibus subtus vix pallidioribus puncticulatis 2–8 cm. longis 4–8 mm. latis saepius alternis et fasciculatis; capitulis parvis 20–40-floris 3.5 mm. diametro subdense corymbosis; involucri campanulati squamis lanceolatis viridibus pilosiusculis; receptaculo convexo vel planiusculo cum paleis oblongis paucis instructo; corollis albis (Gardner) vel rubris (Baker) vel lilaceis (Ktze.) 1.6 mm. longis, tubo proprio granuloso fauces cylindratas glabras subaequante; achaeniis graciliter prismaticis glabris acutangularibus 1.4 mm. longis.— Benth. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 192 (1876). *Isocarpha fastigiata* Gardn. in Hook. Lond. Jour. Bot. v. 455 (1846). *Piqueria fastigiata* Gardn. l. c. vi. 431 (1847). *P. polyphylla* Sch. Bip. ex Bak. l. c. 191 (1876). *Alomia polyphylla* (Sch. Bip.) Bak. l. c. (1876). *Coelestina linearifolia* Sch. Bip. ex Bak. l. c. (1876).— BRASILIA: prov. Minas Geraës in regione Adamantium, locis humidis, *Gardner*, n. 4837 (hb. Kew., phot. in hb. Gray.); Contendas, *Kuntze* (hb. U. S. Nat. Mus.); in eadem provincia, *Riedel*, n. 711, *Pohl*, n. 371, *Sello*, nn. 120, 122; in Brasilia australi locis exactis non datis, *Pohl*, n. 535, *Riedel*, n. 959, *Beyrich;* prov. Rio de Janeiro, *Brunet*, n. 24 (hb. U. S. Nat. Mus.), Tijuca, *Lund* (hb. Havn., fragm. in hb. Gray.), *Ule*, n. 3904 (hb. Berol.).

NOTA.— *A. polyphylla* (Sch. Bip.) Bak. ob foliis angustioribus subintegris separata videtur solum forma inconstans nullo modo subtiliter disjungenda.

7. A. MYRIADENIA (Sch. Bip.) Bak., suffruticosa erecta ascendente ramea; caule tereti brunneo glabrato folioso; ramulis brevissime griseopuberulis et cum glandulis subsessilibus conspersis; foliis rhomboideis oppositis vel ramealibus alternis graciliter petiolatis tenuibus acuminatis incise irregulariterque serratis basi cuneata subintegris juventate plus minusve pilosiusculis maturitate glabratis; capitulis in corymbis parvis subcongestis dispositis ca. 35-floris; involucri campanulati squamis subaequilongis obovati-oblongis herbaceis 4 mm. longis apice

rotundatis scarioso-marginatis ciliato-erosis dorso pilosiusculis; receptaculo conico paleaceo, paleis squamis involucri similibus angustioribus persistentibus; corollis 2.2 mm. longis tubo proprio ca. 0.3 mm. longo extus patentim hirtello, faucibus leviter ampliatis ca. 1.5 mm. longis glabris, limbi dentibus deltoideis vix 0.3 mm. longis patentibus; achaeniis subclavellati-prismaticis 2 mm. longis nigris glabris.—Bak. in Mart. Fl. Bras. vi. pt. 2, 192 (1876). *Piqueria myriadenia* Sch. Bip. ex Bak. l. c. (1876).— Brasilia: prov. Minas Geraës, *Sello*, n. 119; Lagoa Santa, *Warming*, n. 402 (hb. Kew., phot. in hb. Gray.); Rio de Janeiro, *Glaziou*, n. 10,980 (hb. Berol., fragm. in hb. Gray.).

Nota.— Forma corollae cum tubo proprio brevissimo hirtello et faucibus dentes limbi valde superantibus ut ab auctore observata cum descriptione cl. Bakeri male quadrat.

8. **A. longifolia** (Gardn.), comb. nov., fruticosa 1.8–2 m. alta; ramis glabriusculis teretibus striatis; foliis oppositis petiolatis oblongo-lanceolatis penninerviis serratis coriaceis basi acutis apice attenuatis 1–2 dm. longis 1–2 cm. latis glabris reticulato-venosis; capitulis 6–12-floris corymbosis; involucri squamis paucis (6–8) inaequalibus oblongis obtusis 2–3-seriatim imbricatis; receptaculo paleaceo, paleis linearibus apice plus minusve pilosis; corolla glabra; achaeniis prismaticis 5-angulatis glabris, pappo proprio nullo, annulo parvo vix angulato.— *Decachaeta longifolia* Gardn. in Hook. Lond. Jour. Bot. v, 462 (1846); Walp. Rep. vi. 705 (1847). *Ageratum longifolium* (Gardn.) Benth. in Benth. & Hook. f. Gen. ii. 242 (1873) ex Bak. in Mart. Fl. Bras. vi. pt. 2, 197 (1876). *Carelia longifolia* (Gardn.) Ktze. Rev. Gen. i. 325 (1891).— Brasilia: prov. Minas Geraës in regione Adamantium locis calcareis, *Gardner*, n. 4863 (hb. Kew.).

9. **A. heterolepis** (Bak.), comb. nov., fruticosa; ramis virgatis foliosis apicem versus puberulis; foliis oppositis coriaceis lanceolatis ca. 1 dm. longis 2.2 cm. latis apice basique attenuatis utrinque reticulato-venosis supra viridibus glabriusculis subtus griseo-tomentellis; capitulis ca. 36-floris in corymbis congestis dispositis; involucri campanulati 5 mm. diametro squamis oblongis arcte appressis apice rotundatis dorso paullo carinatis ecostatis, interioribus subaequalibus extimis paucis gradatim brevioribus; receptaculo convexo usque ad mediam partem paleifero, paleis oblongis concavis obtusis; corollis 3.7 mm. longis glabris tubulosis, faucibus vix ampliatis; achaeniis 3 mm. longis glabris basi callosis; pappo proprio nullo.— *Ageratum heterolepis* Bak. in Mart. Fl. Bras. vi. pt. 2, 198 (1876).— Brasilia: prov. Bahia, *Blanchet*, n. 3123 (hb. Berol., fragm. et phot. in hb. Gray.).

10. **A. microcephala** (Hemsl.), comb. nov., herba perennis; ramis virgatis teretibus glabris; foliis oppositis late lanceolatis vel ovato-lanceolatis serratis 3-nerviis 5–14 cm. longis 2–4 cm. latis firmiusculis apice basique acuminatis supra viridibus scabridis vel laevibus subtus pallidioribus cum glandulis minutis flavis densissime punctatis omnino epilosis; corymbis terminalibus multicapitulatis densis convexis; capitulis ca. 6 mm. diametro; involucri campanulati viridis squamis lanceolatis attenuatis saepissime 2-costatis glabriusculis vel parce glanduloso-atomiferis; paleis apice indurato-subulatis glabris; corollis glanduloso-atomiferis, tubo proprio fauces subaequante; achaeniis glabris acute 5-angulatis.— *Ageratum microcephalum* Hemsl. Biol. Cent.-Am. Bot. ii. 82, t. 43, ff. 1–5 (1881). *Carelia microcephala* (Hemsl.) Ktze. Rev. Gen. i. 325 (1891).— Mexico: Oaxaca in agris et silvis, alt. 2135 m., *Galeotti*, n. 2098 (hb. Kew., phot. in hb. Gray.); prope Choapam, alt. 1170–1380 m., *E. W. Nelson*, n. 858 (hb. U. S. Nat. Mus., fragm. et icon. simplici in hb. Gray.).

11. **A. guatemalensis**, spec. nov., herbacea perennis erecta 3 dm. vel ultra alta; caulibus teretibus brunneo-pupureis gracilibus virgatis superne crispe griseo-puberulis basin versus glabratis; internodiis perlongis (7–13 cm.) folia superantibus; foliis oppositis lanceolato-linearibus remote serratis vel integriusculis 3-nerviis utrinque obscure et tenuissime pilosis subtus flavido-viridibus glanduloso-punctatis 5–8 cm. longis 4–7 mm. latis longe attenuatis basi acutis breviter petiolatis; corymbis terminalibus longipedunculatis; densis 10–20-capitulatis saepius subglobosis, pedicellis ca. 3 mm. longis tomentellis; capitulis 5 mm. altis 6 mm. diametro ca. 80-floris; involucri campanulati squamis subaequalibus oblongo- vel lineari-lanceolatis acutis ciliolatis dorso 2-costatis pilosiusculis; receptaculo conico ubique paleifero; paleis angustis apice subulato-acutis pallidis corollas subaequantibus; corollis 3.2 mm. longis glabris, tubo proprio fauces paullo vel modice ampliatas aequanti; achaeniis nigrescentibus glabris lucidis acute angularibus basi callosis apice cum annulo cartilagineo humillimo obscure angulato coronatis.— *Ageratum salicifolium* Coult. in J. D. Sm. Enum. Pl. Guat. iv. 72 (1895), non Hemsl.— Guatemala: Canchón, Depart. Santa Rosa, alt. 610 m., Oct. 1894, *Heyde & Lux*, n. 6153 a cl. J. D. Smithio distributa (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.).

12. **A. platylepis**, spec. nov., verisimiliter herbacea perennis; caule tereti primo puberulo maturitate glabrato purpureo folioso; foliis majusculis oppositis breviter petiolatis ovato-lanceolatis caudato-attenuatis subremote serratis basi rotundatis vel acutatis utrinque

glabris viridibus subtus vix pallidioribus minute glanduloso-punctatis 7–10 cm. longis 2.5–3.8 cm. latis supra basin 3-nerviis; corymbis in ramis terminalibus densis pauci(5–8)-capitulatis longiuscule pedunculatis; bracteolis parce pubescentibus linearibus; pedicellis 3–5 mm. longis rectis; capitulis pro genere majusculis 7–9 mm. diametro; involucri turbinato-campanulati squamis ovati- vel obovati-oblongis planis ecostatis acutis erosis pallidis subaequalibus (extimis paucis multo angustioribus exceptis); receptaculo undique paleifero; paleis corollas subaequantibus apice subulatis pallidis induratis; corollis 2.2 mm. longis glabris limbum versus caeruleo-purpureis, tubo proprio faucibus paullo ampliatis longiore; achaeniis nigris glabris 5-angularibus saepe arcuatis basi callosis apice cum annulo parvo albido subintegro coronatis.— GUATEMALA: prope Nenton, alt. 900–1225 m., 13 Dec. 1895, *E. W. Nelson*, n. 3528 (hb. Gray., sub nomine *Isocarpha echioides* distributa).

13. **A. isocarphoides** (DC.), comb. nov., suffruticosa; caule tereti hispido-pubescenti usque ad inflorescentiam terminalem compositam foliato; foliis oppositis 3-nerviis lanceolatis integriusculis vel crenato-dentatis subsessilibus supra scabridis subtus velutino-villosis acuminatis basi cuneato-angustatis; inflorescentia oppositi-ramea; capitulis ca. 25-floris in corymbis densis dispositis.— *Coelestina isocarphoides* DC. Prod. v. 107 (1836), incl. *β dentata*. *Ageratum isocarphoides* (DC.) Hemsl. Biol. Cent.-Am. Bot. ii. 82 (1881). *Carelia isocarphodes* [DC.] Ktze. Rev. Gen. i. 325 (1891).— MEXICO, sine loci indicio accuratiori, *Haenke* (hb. DC., phot. in hb. Gray.); in cultis prope Orizabam, *Botteri & Sumicrast*, n. 524 (hb. Gray., immatura et dubitativa). Species minus cognita, an cum sequenti conjungenda?

14. **A. echioides** (Less.), comb. nov., herbacea perennis; radice fibrosa; caulibus solitariis vel paucis virgatis suberectis simplicibus vel rariter ramosis saepius ad mediam partem solum foliosis hirsuto-villosis; foliis lanceolati-oblongis 3-costatis serrato-dentatis vel saepius integriusculis basi cuneatis apice gradatim angustatis sed vix vero acutis 2.5–9 cm. longis 8–18 mm. latis utrinque villoso-hirsutis subtus paullo pallidioribus glanduloso-punctatis; corymbis terminalibus saepius densis rarius trichotomis et laxioribus; bracteis parvis linearibus; capitulis 7 mm. diametro ca. 50-floris; involucri campanulati squamis lanceolato-oblongis viridibus vel purpurascentibus ciliolatis saepius 2-costatis apicem versus subinduratis pallidioribus; receptaculo valde elevato subcylindrato-conico undique paleifero; corollis subcylindricis sparse pubescentibus 3 mm. longis caeruleo-purpureis, tubo proprio fauces vix ampliatas fere aequante; achaeniis nigris

argute 5-angulatis glabris lucidulis ca. 2 mm. longis.— *Isocarpha echioides* Less. Linnaea, v. 141, t. 2, ff. 14–16 (1830); DC. Prod. v. 107 (1836); Hemsl. Biol. Cent.-Am. Bot. ii. 167 (1881). *Ageratum echioides* (Less.) Hemsl. Biol. Cent.-Am. Bot. ii. 81 (1881). *Carelia echiodes* [Less.] Ktze. Rev. Gen. i. 325 (1891).— MEXICO: Vera Cruz, in graminosis prope Hacienda de la Laguna, *Schiede*, n. 304 (hb. Berol., icon. simplici et fragm. in hb. Gray.); prope Mirador, *Sartorius* (hb. Gray.), *Liebmann*, n. 143 (f. Hemsl. l. c.), n. 144 (hb. Havn.); *Linden* n. 1156 (f. Hemsl. l. c.); Jalapa, alt. 915 m., *Galeotti*, n. 2200; Orizaba, *Botteri*, n. 623 (hb. Gray.), *Müller*, n. 1129 (f. Hemsl. l. c.), *Bourgeau*, n. 2393 (hb. Gray.), *Sallé* (f. Hemsl. l. c.), *Thomas* (hb. Gray.); Escamella, *Bourgeau*, n. 3207 (hb. Gray.); Zacuapan, *Purpus*, n. 2199 (hb. Gray., hb. U. S. Nat. Mus.).

15. A. CINEREA (Gardn.) Benth., suffruticosa griseo-puberula; caulibus pluribus teretibus striatis glanduloso-tomentellis foliosis alterni-rameis apicem versus corymboso-ramosis; foliis alternis saepe fasciculatis patentibus linearibus 4–7.5 cm. longis 3–6 mm. latis obscure crenulatis apice rotundatis basi angustissimis sessilibus utrinque griseo-tomentellis; capitulis ca. 35-floris breviter pedicellatis modice numerosis; involucri campanulati 4 mm. diametri squamis subaequalibus anguste lanceolati-oblongis obtusis dorso glanduloso-puberulis apicem versus longius ciliatis; corollis roseis extus dense hirsutis ca. 2 mm. longis in fauces ampliatis; achaeniis prismaticis 5-angularibus nigrescentibus glabris calvis basi callo conspicuo munitis.— Benth. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 191 (1876). *Piqueria cinerea* Gardn. in Hook. Lond. Jour. Bot. vi. 432 (1847).— BRASILIA: prov. Goyaz, in campis siccatis altis prope Villam de Arrayas, *Gardner*, n. 3810 (hb. Kew., phot. in hb. Gray.).

16. A. DUBIA Robinson, herbacea perennis glandulari-tomentosa 4–7 dm. alta; caudice erecto; caulibus teretibus striatulis foliosissimis usque ad inflorescentiam corymbosam simplicissimis; foliis (infimis caducis suboppositis exceptis) alternis oblanceolatis 2–3 cm. longis 5–9 mm. latis obtusis basin versus attenuatis vix petiolatis supra rugulosis subtus reticulatis utrinque sed praesertim in pagina inferiori glandulari-granulosis et sordide pubescentibus; capitulis ca. 1 cm. diametro 65-floris in corymbis laxis dispositis; involucri campanulati squamis sub-biserialibus herbaceis lanceolato-linearibus dorso dense glanduloso-pulverulis et apicem attenuatam versus plus minusve lanato-pilosis; corollis roseis 4 mm. longis tubo proprio gracili extus glanduloso-hirtello, faucibus turbinato-campanulatis, limbo purpurascenti-tomentello; achaeniis nigris 5-angularibus glabris basin

versus attenuatis apice annulo integerrimo cartilagineo coronatis.— BRASILIA: prov. Goyaz, *Glaziou*, n. 21,579 (hb. Berol., hb. Kew., fragm. in hb. Gray.).

17. A. AGERATOIDES HBK., herbacea perennis suberecta diffuse ramosa 3 dm. vel ultra alta; ramis oppositis teretiusculi-tetragonis primo obscure hirtellis, tardius glabratis foliatis saepissime brunnescentibus; foliis oppositis petiolatis ovatis acutis acute serratis vel subintegris 1.5–3.5 cm. longis 1–1.4 cm. latis trinerviis primo sparse hirtellis mox glabrescentibus subtus distincte pallidioribus; petiolis brevibus 2–4 mm. longis plus minusve pilosis ciliatisque; capitulis parvis ca. 6 mm. diametro ca. 25-floris laxe cymoso-paniculatis, ramulis paniculae sympodialibus scorpioideis, pedicellis filiformibus rectiusculis vel leviter arcuatis 1–3 cm. longis, bracteolis parvis 1–3 subulati-linearibus instructis; involucri campanulati squamis ca. 30 sub-biserialibus lanceolatis acutis saepissime 2-costatis; corollis purpureis 1.8 longis glabris vel glabriusculis, tubo proprio faucibus subcylindratis breviori; achaeniis glabris nitidis nigrescentibus acute 5-angulatis saepe leviter curvatis 1.5 mm. longis.— Nov. Gen. et Spec. iv. 152, t. 354 (1820); Hemsl. Biol. Cent.-Am. Bot. ii. 79 (1881); Hoffm. in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5, 134, f. 78 A (1890). *Ethulia ageratoides* (HBK.) Spreng. Syst. iii. 458 (1826). *Phalacraea Lindenii* Sch. Bip. ex Benth. & Hook. f. Gen. ii. 240 (1873).— MEXICO: Guerrero prope Mescala, *Humboldt & Bompland*, n. 3949 (hb. Par., phot. in hb. Gray.); Puebla ad Matlala, *Liebmann*, n. 84 (hb. Havn., hb. Gray.); Hidalgo ad Cazadera, *Liebmann*, n. 82 (hb. Havn., fragm. in hb. Gray.), sine loco indicato, *Liebmann*, n. 83 (hb. Havn., fragm. in hb. Gray.). Duo ultima sunt forma dubia inflorescentiis densioribus et ut apud *Ageratum littorale* vel *A. maritimum* longe pedunculatis.

18. A. ANGUSTATA (Gardn.) Benth., annua erecta pauciramea 4–6 dm. alta; radice fibrosa; caule tereti striato cum pilis glanduloso-viscosis instructo; foliis plerisque alternis longe graciliterque petiolatis ovato-deltoideis vel rhomboideis grosse inaequaliterque dentatis vel lobatis utrinque pilosis 3-nerviis 6–7.5 cm. longis basi subtruncatis, dentibus sinubusque obtusis, illis mucronulatis; petiolis et pedunculis viscoso-pilosis; capitulis 12–15-floris ad apices ramorum in corymbulis irregulariter dichotomis dispositis; involucri squamis ca. 12 glanduloso-pilosis herbaceis acuminatis 3-nerviis 5 mm. longis sub-biseriatis ciliatis; corollae tubo proprio glandulari-puberulo, faucibus modice ampliatis; achaeniis prismaticis nigris calvis.— Benth. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 190 (1876). *Piqueria angustata* Gardn. in Hook. Lond. Jour. Bot. vi. 432 (1847).— BRASILIA: prov. Goyaz, in

locis saxosis silvarum umbrosarum, prope Villam de Arrayas, *Gardner*, n. 3809 (hb. Kew., phot. in hb. Gray.); prov. Minas Geraës, ad Lagoa Santa, *Warming* f. Bak. l. c.

Nota.— Folia usque adhuc ab auctore observata leviter vel modice dentato-lobata sunt sed numquam profunde pinnatifida ut a cl. Bakero, l. c., descripta. Specimen typicum est Gardneri n. 3809 nec ut in Fl. Bras. 3089 datum.

19. **A. Wendlandii** (Sch. Bip.), comb. nov., perennis 3 dm. vel ultra altitudine; caule tereti viridi striatulo pubescenti; internodiis paucis elongatis ca. 1 dm. longitudine; foliis oppositis ovatis tenuibus argute serratis ca. 6 cm. longis ca. 4 cm. latis apice acuminatis basi obtusiusculis supra tenuiter pubescentibus subtus paullo pallidioribus molliter griseo- vel cinereo-tomentosis; petiolo gracili 1–2.8 cm. longo dense pubescenti; corymbis longiuscule pedunculatis trichotomis planiusculis densis multicapitulatis ca. 5 cm. diametro; bracteis filiformibus; pedicellis filiformibus 2–8 mm. longis; capitulis erectis 60–70-floris 6–6.5 mm. altis 6 mm. diametro; involucri ovoideo-turbinati squamis oblanceolatis attenuatis sub-biseriatim imbricatis subaequalibus saepius 2-costatis dorso griseo-puberulis et cum glandulis minutis obscure nigro-punctatis; corollis saltim limbum versus caeruleis 2.7 mm. longis, tubo proprio glanduloso-hispidulo, faucibus subaequilongis parce glanduloso-atomiferis; achaeniis nigrescentibus acute 5-angulatis 1.6 mm. longis saepius curvatis apice cum annulo integro cartilagineo coronatis basi callosis.— *Phalacraea Wendlandii* Sch. Bip. ex Klatt, Leopoldina, xx. 74 (1884), in synon. et sine char. ?*Ageratum Wendlandii* Hort. ex Vilm.Fl. de pl. terre, Suppl. 2 (1884).— Mexico: ad "Gualulu" verisimiliter lapsu pennae pro Guatulco (seu Huatulco) in civitate Oaxaca, *Liebmann*, n. 147 (hb. Havn., fragm. in hb. Gray.); Etzatlan in civitate Jalisco, *Pringle*, n. 11,819 (hb. Gray.).

Nota.— *Ageratum Wendlandii* Hort. huc dubitanter locatum variat flosculis albis f. Vilm. l. c.

20. **A. microcarpa** (Benth.), comb. nov., herbacea annua erecta vel decumbens undique molliter pilosa 3–6 dm. alta; radice fibrosa; caulibus teretibus saepius flexuosis medullosis usque ad inflorescentiam foliatis viridibus vel purpureis; foliis oppositis petiolatis deltoideo-ovatis saepius cordatis vel subcordatis 3–6 cm. longis 2–4 cm. latis crenato-serratis obtusis vel vix acutiusculis membranaceis subconcoloribus utrinque pilosis; petiolo 8–18 mm. longo saepius hirsuto; corymbis terminalibus et ex axillis superioribus oriuntibus densis multicapitulatis; capitulis ca. 60-floris; involucri campanulati squamis anguste lanceolatis saepius 2-costatis attenuatis viridibus plus

minusve pilosis; corollis limbum versus caeruleo-purpureis, tubo proprio gracili glanduloso-atomifero fauces cylindratas glabras distincte ampliatas fere aequanti; achaeniis nigris glabris argute 5-angulatis prismaticis 1.1 mm. longis.— *Coelestina microcarpa* Benth. ex Oerst. Vidensk. Meddel. 1852, p. 72 (1852). *Ageratum microcarpum* (Benth.) Hemsl. Biol. Cent.-Am. Bot. ii. 82 (1881).— COSTA RICA: in graminosis, etc., Cartago, *Oersted*, nn. 241, 247, 248 (omnia in hb. Kew., phot. in hb. Gray.); in pascuis ad Général, *Pittier*, n. 3415 (hb. Gray.); Turrialba in pascuis, alt. 1200 m., *Pittier*, n. 4139 (hb. Gray.); Aguacaliente secundum viam ferriam, alt. 1300 m., *Pittier*, n. 2390 (hb. Gray., hb. J. D. Sm.); Poaz, alt. 2200 m., *Tonduz*, n. 10,816 (hb. Gray.); in sepis secundum vias, San José, *Tonduz*, n. 7281 (hb. Gray., hb. J. D. Sm.); in terris cultis et incultis, San José, alt. 1135 m., *Pittier*, n. 3533 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); in pascuis, San Francisco de Guadeloupe, alt. 1170 m., *Tonduz*, n. 8479 (hb. U. S. Nat. Mus., hb. J. D. Sm.); in agro ad Juan Viñas, alt. 1000 m., *Cook & Doyle*, n. 277 (hb. U. S. Nat. Mus.). VENEZUELA: ad Caracas, *Linden*, n. 349 (hb. Kew.), forma dubia parvifolia.

Subg. 3. **Lycapsus** (Phil.), subg. nov. Involucri squamae 6–8 subuniseriales subaequales angustae herbaceae enerviae. Receptaculum paleaceum. Corollae fauces distincte ampliatae. Styli rami pro tribu breviusculi valde spiraliter recurvati.— *Lycapsus* Phil. Bot. Zeit. xxviii. 499, t. 8A (1870).— Frutex xerophyticus. Folia alterna pinnatipartita. **Species 1 chilensis.**

21. A. TENUIFOLIA (Phil.) Benth. & Hook. f., fruticosa ramosa glaberrima; foliis alternis crassiusculis pinnatipartitis, rhachi laciniisque filiformibus; petiolo ca. 17 mm. longo rhachin subaequanti, laciniis utrinque 3–4 oppositis vel alternis usque ad 9 mm. longis 1.3 mm. crassis; capitulis corymbosis pedicellatis; bracteolis 1–2 linearisetaceis 3–4 mm. longis; involucri hemisphaerici squamis 3 mm. longis lanceolati-linearibus herbaceis subaequalibus vix imbricatis corollas aequantibus; corollis verisimiliter albis; tubo proprio glandulariatomifero fauces glabras cylindratas aequanti; limbi dentibus 5 patentim recurvatis; achaeniis 2 mm. longis granulosis deorsum decrescentibus.— Benth. & Hook. f. Gen. ii. 240 (1873), sine combinatione definitiva sed ex Reicheo, Fl. de Chil. iii. 260 (1901).— CHILI: **in insula San Ambrosio.**

NOTA.— Haec planta minime cognita a navarcho innominato navis bellicae chilensis in petaso suo collecta fide cl. Philippii (l. c. 501) in insula San Ambrosio inveniebatur, nec ut dicit cl. Reiche (l. c.) in insula San Felix.

Species reducta vel exclusa.

A. Armani (Balbis) Bak. in Mart. Fl. Bras. vi. pt. 2, 191 (1876). *Eupatorium Armani* Balbis, Pl. Rar. Hort. Turin, 1810, p. 27, t. 6 (1810). *Orsinia Eupatoria* DC. Prod. v. 104 (1836). *Piqueria Eupatorium* (DC.) Gardn. in Hook. Lond. Jour. Bot. vi. 430 (1847). *Clibadium rotundifolium* DC. Prod. v. 505 (1836); Bak. l. c. vi. pt. 3, 152 (1884), ubi syn. alia. = CLIBADIUM ARMANI (Balbis) Sch. Bip. ex Bak. l. c. (1884).

A. polyphylla (Sch. Bip.) Bak. = A. FASTIGIATA (Gardn.) Benth.

A. spilanthoides D. Don ex Hook. & Arn. Comp. Bot. Mag. i. 238 (1835) = GYMNOCORONIS SPILANTHOIDES (D. Don) DC. Prod. vii. 266 (1838).

2. REVISION OF THE GENUS AGERATUM.

The genus *Ageratum* L. has not been subjected to any general revision since its treatment in DeCandolle's Prodromus in 1836. For many years it has been made to include plants of a considerable range of habit and, what is more noteworthy, though chiefly defined by its pappus, has been allowed to contain species of widely divergent character in just this matter. While the more typical species have a pappus of five distinct scales, others have a cup-like crown of very short and connate scales; still others have been admitted into the genus which instead of scales of definite number have short or long, slender or slightly thickened, smooth or plumose bristles of indefinite number ranging from 8 to 20 or more. Finally certain species have been included from similarity of habit which possess no true pappus whatever but merely a sort of annulus beneath rather than exterior to the corolla.

To render the genus properly natural and compact, as well as to permit its more precise definition, it seems best to refer to *Alomia* the species destitute of pappus, and to exclude also those species which have a bristle pappus. The latter group consists of six South American species, namely *A. Agrianthus* Hoffm. (*Agrianthus corymbosus* DC.), *A. alternifolium* (Gardn.) Bak., *A. campuloclinioides* Bak., *A. confertum* (Gardn.) Benth., *A. melissaefolium* DC., and *A. Pohlianum* Bak. At first, it seemed likely that these species could be appropriately separated as a distinct genus. Schultz-Bipontinus seems to have planned such a segregation in his undescribed *Melissopsis*. The species, however, differ much among themselves, both as to habit

and technical characters, and several are scarcely to be separated from *Trichogonia* except by their slightly shorter and thicker pappus-bristles. Their satisfactory generic disposition must await further study, for which there is no adequate material as yet available in the North American herbaria.

The other two elements traditionally included in *Ageratum*, namely, the true Ageratums with pappus of distinct scales, and *Coelestina* Cass. with cuplike or crownlike pappus, are groups of very close affinity, by no means sharply separable. It is believed that they are best treated merely as sections of the genus *Ageratum*.

The writer has not had many opportunities to follow up the various forms of *Ageratum* which have received horticultural names. So far as seen these have proved merely cultural improvements of the common annuals, *A. conyzoides* L. and especially *A. Houstonianum* Mill. *A. rubens* Viviani, early described from cultivated material, has never been recognized. *A. Lasseauxii* Carr., to judge from a supposably authentic specimen in the Gray Herbarium, is clearly a species of *Eupatorium*. *A. conspicuum* Hort. is generally believed to have been *Eupatorium glechonophyllum* Less. *Ageratum Wendlandii* of Vilmorin's Fleurs de pleine terre, Suppl. 2 (1884), with uncharacteristic figure and mere horticultural description, was presumably founded on the same plant as the one to which Schultz-Bipontinus applied the manuscript name *Phalacraea Wendlandii*, later published in synonymy by Klatt. If this is the case Vilmorin's plant was the one described elsewhere in this paper as *Alomia Wendlandii* and came from the uplands of southern central Mexico. It would seem probable that both *Ageratum* and *Alomia* would repay further horticultural attention, there being several other species quite as promising as those already brought into cultivation.

AGERATUM L. (Nomen ab antiquis et graece et latinice ad plantam aliquem non viescentem non certe cognitam fortasse ut dicitur *Achilleam* applicatum.)— Capitula homogama tubuliflora. Involucrum plerumque campanulatum rariter turbinato-subcylindratum vel hemisphaericum, squamis angustis longitudine subaequalibus 2–3-seriatim imbricatis (cum vel absque squamulis 1–3 extimis multo brevioribus) plerisque lanceolato-linearibus acutis vel attenuatis saepius 2(1–4)-costatis. Receptaculum planum vel convexum vel conicum nudum vel paleiferum. Corolla 5-dentata limbum versus saepius caerulea vel purpurea vel alba rarius rosea, tubo proprio superne sensim in fauces subcylindratas plus minusve ampliato.

Antherae oblongae vel lineares apice cum appendicem membranaceam ovatam vel oblongam munitae basi rotundatae. Achaenia 5-angulata prismatica vel deorsum paullo decrescentia. Pappus e squamis apice setiferis vel muticis distinctis vel basi connatis vel in coronam crateriformem integram vel dentatam compositus.— Sp. Pl. ii. 839 (1753); DC. Prod. v. 108 (1836); Benth. & Hook. f. Gen. ii. 241 (1873), excl. syn. *Decachaeta* et *Oxylobus;* Bak. in Mart. Fl. Bras. vi. pt. 2, 193 (1876), pro parte; Hemsl. Biol. Cent.-Am. Bot. ii. 80 (1881), pro parte majori; Gray, Syn. Fl. i. pt. 2, 93 (1884); Hoffm. in Engl. & Prantl. Nat. Pflanzenf. iv. Ab. 5, 137 (1890), excl. syn. *Oxylobus;* Dalla Torre & Harms, Gen. Siph. 527 (1905), excl. syn. *Oxylobus, Melissopsis, Decachaeta.* *Carelia* Adans. Fam. ii. 123 (1763); Ktze. Rev. Gen. i. 325 (1891). *Coelestina* Cass. Bull. Soc. Philom. Par. 1817, p. 10 (1817); DC. Prod. v. 107 (1836), partim. *Caelestina* Cass. Dict. Sci. Nat. vi. suppl. 8, t. 93 (1817).— Herbae annuae vel perennes vel suffrutices vel frutices. Folia saepius opposita rariter alterna saepissime ovata vel lanceolata crenata vel serrata rariter integra sessilia vel petiolata saepe glandulari-punctata. Inflorescentia plerumque terminalis corymbosa vel cymosa saepius composita.

Genus extraneis expurgatis e speciebus 27 sistens quarum 19 regionem mexicano-centrali-americanam incolunt, aliae inter Floridam australem et insulas Indiae Occidentalis et Americam Australem calidiorem distributae, una africana, una in terris calidioribus latissime dispersa.

Sect. I. Euageratum DC. Pappi squamae omnino distinctae vel imo paullulo connatae nunc longae et apice setiferae corollam subaequantes nunc mutices corolla multo breviores rariter (apud *A. maritimi* et *A. littoralis* formas nonnullas) omnino desunt.— Prod. v. 108 (1836). *Ageratum verum* Bak. in Mart. Fl. Bras. vi. pt. 2, 194 (1876), pro parte.— Species 13 pleraeque herbaceae saepius annuae.

Clavis specierum.

a. Caulis procumbens vel prostratus repens *b.*
  b. Folia parva suborbicularia profunde crenata. Capitula solitaria 1. *A. domingense.*
  b. Folia majora lanceolata subintegra. Capitula cymosa 2. *A. radicans.*
a. Caulis erectus vel plus minusve decumbens *c.*
  c. Folia sessilia integra *d.*
    d. Folia subtus griseo-incana. Afr.....3. *A. polyphyllum.*
    d. Folia subtus glabra viridia. Am. Cent.....4. *A. Peckii.*
  c. Folia petiolata crenata vel dentata *e.*
    e. Pappi paleae omnes vel nonnullae apice setiferae corollam aequantes *f.*

f. Capitula subcongestim cymoso-corymbosa *g*.
g. Decumbens superne nudum. Sp. maritima
13. *A. littorale*, f. *setigerum*.
g. Erectum vel suberectum saepius usque ad inflorescentiam foliosum *h*.
h. Annuum. Pars pappi palearum squamiforme dilatata setam fere aequans *i*.
i. Involucri squamae lanceolato-lineares integrae ciliolatae longe in apicem peracutam attenuatae saepius coloratae dorso hirsutae.....5. *A. Houstonianum*.
i. Involucri squamae oblongae subabrupte acuminatae ciliatae saepius margine plus minusve dentatae vel erosae dorso parce pubescentes vel glabriusculae
6. *A. conyzoides*.
h. Suffruticosum. Pars pappi palearum squamiforme dilatata quam seta triplo brevior.....7. *A. suffruticosum*.
f. Inflorescentia laxa; capitulis omnibus longiuscule (1–4 cm.) pedicellatis.....8. *A. Gaumeri*.
e. Pappi paleae omnes muticae corollae tertiam partem longitudine vix aequantes *j*.
j. Erectum vel suberectum. Folia 2–8 cm. longa. Sp. non maritimae *k*.
k. Perenne. Folia serrata longe attenuata acuta. Guatemala
9. *A. rugosum*.
k. Perenne. Folia crenata obtusa vel obtuse acuminata. Petiolo obcompressi late planiusculi. Caulis paullo lignescens. Involucrum basi saepius umbonatum. Mex.
10. *A. platypodum*.
k. Annuum omnino herbaceum. Petioli subteretes. Involucrum basi plus minusve acutatum.....11. *A. latifolium*.
j. Decumbens. Folia 1–1.8 cm. longa. Sp. maritimae *l*.
l. Caulis usque supra mediam partem foliosus. Folia ovato-oblonga vel anguste deltoidea regulariter crenata. Corymbi 3–5-capitulati.....12. *A. maritimum*.
l. Caulis vix ad mediam partem foliosus. Folia rhomboideo-ovata vel infimis breviter lateque deltoidea. saepissime inciso-dentata. Corymbi 4–13-capitulati
13. *A. littorale*.

1. A. DOMINGENSE Spreng., herbaceum pusillum prostratum reptans; caule gracili ad nodos radicantes folia et ramos suberectos basi foliatos apice floriferos et etiam scapos nudos unicapitatos gerenti; foliis oppositis suborbicularibus 6–12 mm. diametro tenuibus grosse crenato-lobulatis cordatis, petiolis 3–16 mm. longis; capitulis solitariis terminalibus 5–8 mm. diametro; involucri turbinati squamis viridibus tenuibus vix costatis oblanceolatis acutis laxe imbricatis subaequilongis dorso laxe pilosis; pedunculis vel scapis flexuosis saepe nutantibus 3–7.5 cm. longis; corollis albis 2 mm. longis glanduloso-atomiferis, tubo proprio gracili faucibus campanulatis brevioribus; achaeniis glabris nigris lucidis deorsum decrescentibus basi substipitati-callosis; pappi squamulis oblongis fimbriatis quam achaenio bis brevioribus.— Syst. iii. 446 (1826). *Phania domingensis*

(Spreng.) Griseb. Cat. Pl. Cub. 145 (1866). *Carelia domingensis* (Spreng.) Ktze. Rev. Gen. i. 325 (1891). *Eupatorium planellasianum* Maza & Molt. An. Hist. Nat. Madr. xix. 271 (1890).— SANTA DOMINGO: *Bertero* (hb. DC., icon. simpl. in hb. Gray.). CUBA: in ripis fluminis Sta. Catalina, *Wright*, n. 2798 (hb. Gray.); in saxis prope San Diego de Tapia, *Wright* (hb. Gray.); sub fruticibus in collibus petrosis Bahia Honda, prov. Pinar del Rio, *Wilson*, n. 9405 (hb. Gray.).

NOTA.— Quamquam planta domingensis a cl. Sprengel glabra descripta sit ea cubensis tamen distincte pubescens se exhibet.

2. A. RADICANS Robinson, herbaceum glabrum prostratum reptans; caule tereti crassiusculo medulloso; ramis patentibus ad nodos saepe radicantibus apicem versus ascendentibus; foliis oppositis lanceolatis vel anguste elliptico-oblongis 3-nerviis integriusculis utroque angustatis apice obtusis utrinque glabris supra viridibus subtus vix pallidioribus impunctatis 4–8 cm. longis 5–15 mm. latis breviter petiolatis; pedunculis nudis cymos parvos 2–3-capitulatos terminales vel etiam laterales gerentibus; capitulis breviter pedicellatis 8–10 mm. diametro; involucri squamis lanceolatis vel linearibus fere a basi ad apicem attenuatis 2-costatis peracutis glabris; receptaculo parvo convexo nudo; corollis glabris limbum versus purpureis; achaeniis acute 5-angularibus 1.2 mm. longis glabris; pappi paleis 5 ovatis scariosis apice in setam productis corollam aequantibus.— Proc. Am. Acad. xlvii. 192 (1911).— BALIZE: in aquis dulcis prope Manatee Lagoon, *Peck*, n. 99 (hb. Gray.).

3. A. POLYPHYLLUM Bak., herbaceum perenne foliosissimum; caulibus erectis simplicibus pubescentibus; foliis sessilibus oppositis lanceolatis integris 1–2.5 cm. longis margine revolutis supra glabris viridibus subtus griseo-incanis tomentosis; corymbis densis; capitulis ca. 5 mm. diametro multifloris; involucri campanulati squamis lanceolatis pauciseriatim imbricatis extimis gradatim brevioribus; corollis rubris tubo proprio pubescenti; achaeniis glabris; pappi paleis paucis obtusis quam corolla triplo brevioribus.— Kew Bull. 1898, p. 148 (1898).— AFRICA CENTRALIS ANGLICA: ad Nyikam, alt. 1800–2150 m., *Whyte*, n. 252. Non vidi.

4. A. PECKII Robinson, herbaceum annuum erectum 5 dm. altum fastigiatim ramosum glabrum; radice fibrosa; caule subtereti basin versus crassiusculo nodoso; foliis lineari-oblongis integris 3-nerviis 2.5–4.5 cm. longis 2.5–6 mm. latis acutiusculis sed in apice vero obtusis basi petioliforme attenuatis margine revolutis; capitulis paucis

3.5–4 mm. diametro ca. 20-floris in cymis dichotomis dispositis; bracteolis lineari-subulatis 2–4 mm. longis; involucri squamis linearilanceolatis attenuatis saepius 2-costatis acutissimis longitudine subaequalibus glabris; corollis glabris caeruleo-purpureis; achaeniis nigris 5-angularibus in angulis parce hispidulis in faciebus obscure granulosis; pappi paleis ovatis scariosis argenteis plus minusve laciniatis apice setiferis corollam aequantibus.— Proc. Am. Acad. xlvii. 191 (1911).— BALIZE: in apertis arenosis in collibus piniferis prope Manatee Lagoon, *Peck*, n. 80 (hb. Gray.).

5. A. HOUSTONIANUM Mill., annuum robustum erectum vel decumbens; caule tereti medulloso per totam longitudinem folioso patentim piloso plus minusve ramosum; foliis oppositis late deltoideo-ovatis saepius crenatis hinc inde (in eodem individuo) acute serratis basi saepissime late cordatis rarius truncatis vel paullo acutatis apice saepius obtuse acuminatis 3.5–12 cm. longis 1.5–9 cm. latis tenuibus utrinque viridibus hirsutis subtus paullo pallidioribus impunctatis; corymbis terminalibus saepe compositis densis valde convexis multicapitulatis glanduloso-hirtellis et cum pilis moniliformibus albis longius hirsutis; capitulis ca. 8 mm. diametro ca. 75-floris; involucri squamis anguste lanceolatis vel lanceolato-linearibus integris herbaceis longe continenterque attenuatis acutissimis ciliolatis apicem versus saepius purpureis dorso 2-costatis glandulari-puberulis et conspicue hirsutulis; corollis gracillimis ca. 3 mm. longis limbum versus caeruleis, tubo proprio parce glandulari-puberulo fauces cylindratas glabriusculas aequanti vel paullo superanti, limbi dentibus extus hispidulis; achaeniis nigris nitidis saepius in angulis et etiam plus minusve in faciebus sursum hispidulis ca. 1.2 mm. longis; pappi paleis 5 lanceolatis margine fimbriatis apice longe setiferis, setis sursum scabridis corollas subaequantibus.— Dict. ed. 8, n. 2 (1768). *A. mexicanum* Sims, Bot. Mag. t. 2524 (1825); Sweet, Brit. Fl. Gard. t. 89 (1825), a copia eadem ac ea Simsii descripta, pappi squamulis a cl. Sweetio per errorem nimium brevioribus depictis; Hemsl. Biol. Cent.-Am. Bot. ii. 82 (1881), pro parte. *A. conyzoides*, var. *mexicanum* (Sims) DC. Prod. v. 108 (1836). *A. conyzoides* Hemsl. l. c. 81 (1881), pro parte, non L. *Carelia Houstoniana* (Mill.) Ktze. Rev. Gen. i. 325 (1891).— MEXICO: praesertim in civitate Vera Cruz: Cordova, *Bourgeau*, n. 1557 (hb. Gray., hb. U. S. Nat. Mus.); Orizaba, alt. 1220 m., *Seaton*, n. 55 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); Jalapa, *Schiede*, f. Hemsl. l. c., alt. 1220 m., *Pringle*, no. 8065 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); Fortin, *Kerber*, n. 302 (hb. Havn.); Mirador, *Sartorius* (hb. Gray.); Coatzacoalcos, *C. L. Smith*, n. 145 (hb. Gray.), n. 979

(hb. U. S. Nat. Mus.); Huasteca, Tantoyuca, *Ervendberg*, n. 100 (hb. Gray.); Tepic, *Palmer* (anno 1892), n. 2066 (hb. U. S. Nat. Mus.). COSTA RICA: San Rafael de Cartago, *Pittier*, n. 6995 (hb. Gray.). GUATEMALA: Alta Vera Paz, *Goll*, n. 238 (hb. U. S. Nat. Mus.). CUBA: in agro nicotianae, Pinar del Rio, *Palmer & Riley*, n. 65 (hb. U. S. Nat. Mus.), fl. roseis. JAMAICA: *Eggers*, n. 3445 (hb. J. D. Sm.); Cinchona, alt. 1525 m., *Clute*, n. 190 (hb. U. S. Nat. Mus.); in marginibus silvarum, Morce's Gap, alt. 1525 m., *Nichols*, n. 33 (hb. Gray., hb. U. S. Nat. Mus.). MARTINIQUE: cultum et erratum, *Duss*, n. 4681 (hb. U. S. Nat. Mus.), partim. BRASILIA: Rio de Janeiro, *Rudio* (hb. Gray., hb. U. S. Nat. Mus.). ST. HELENA: *Brown & Brown*, n. 254 (hb. U. S. Nat. Mus.). ASSAM: Mangaldai, *Chatterjee* (U. S. Nat. Mus.).

NOMEN VULGATUM hispanice (Mex.) "Yerba de zopilote" ex cl. Kerbero.

NOTA.— Haec species pro genere optima, origine certe austro-mexicana est diu ob floribus laete caeruleis vel albis perornatis ubique culta et aliter ex hortis errata vel fortuite dispersa saepe in locis incultis vel ruderatis reparatur.

6. A. CONYZOIDES L., annuum pubescens oppositi-rameum normaliter erectum rarius decumbens 2.5–9 dm. altum; radice fibrosa; caule molli tereti patentim pubescenti saepius purpurascenti per totam longitudinem folioso; ramis patentim ascendentibus; foliis ovatis plerisque obtusis basi rotundatis vel breviter cuneatis rarius late cordatis crenatis vel rarius serratis tenuibus utrinque parce pilosis subtus dilutiore viridibus 2–8 cm. longis 1.5–6 cm. latis a basi 3(–5)-nerviis impunctatis vel subtus glandulis paucis inconspicuis consper-sis; petiolis 0.5–3 cm. longis hirsutis; corymbis in caule ramisque terminalibus saepe compositis (3–)8–40-capitulatis valde convexis breviter pedunculatis; pedicellis filiformibus 3–7 mm. longis glandu-losis vel hispidulis; bracteolis setaceis; capitulis 50-floris ca. 6 mm. diametro; involucri campanulati squamis oblongis viridibus saepius 2-costatis apice subabrupte acuminatis margine scariosis sub acumine saepius erosis et ciliatis dorso parce pilosis vel glabriusculis; recepta-culo nudo; corollis limbum versus caeruleis ca. 2 mm. longis, tubo proprio gracili fauces modice ampliatas paullo superanti glabriusculo vel glandulari-puberulo; achaeniis nigris nitidis in angulis saepius minute sursum hispidulis; pappi paleis 5 lanceolatis margine fimbrio-latis apice setiferis corollam subaequantibus.— Sp. Pl. ii. 839 (1753). *A. hirtum* Lam. Dict. i. 54 (1783). *A. conyzoides*, β *hirtum* (Lam.) DC. Prod. v. 108 (1836). *A. hirsutum* Poir. Suppl. i. 242 (1810), sphalm. pro *hirtum*. *A. odoratum* Vilm. Fl. Pl. Terre, ed. 2, 42 (1866).

Cacalia mentrasto Vell. Fl. Flum. 339 (1825), viii. t. 69 (1827). *Carelia conyzodes* [L.] Ktze. Rev. Gen. i. 325 (1891), cum varietatibus vegetivis *robusta, umbrosa, pusilla, coerulea.*— MEXICO: Tepic, *Palmer* (anno 1892), n. 1850 (hb. Gray., hb. U. S. Nat. Mus.), n. 1890 (hb. Gray.). GUATEMALA: *Heyde*, n. 530 (hb. U. S. Nat. Mus.); Santa Rosa, alt. 915 m., *Heyde & Lux* (distrib. J. D. Sm.), n. 3781 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); Coban, alt. 1310 m., *v. Tuerckheim* (distrib. J. D. Sm.), n. 488 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.), alt. 1350 m., *v. Tuerckheim*, n. II 999 (hb. U. S. Nat. Mus.); Gualan, *Deam*, n. 330 (hb. Gray., hb. U. S. Nat. Mus.); Alta Vera Paz, *Cook & Griggs*, n. 560 (hb. U. S. Nat. Mus.); prope Nenton, alt. 915–1220 m., *Nelson*, n. 3542 (hb. J. D. Sm.); in agris gossypii vulg., prope Mazatenango, alt. 350 m., *Maxon & Hay*, n. 3487 (hb. U. S. Nat. Mus.); El Paxte, in monte igniv. Ipala, alt. 1000 m., *Pittier*, n. 1891 (hb. U. S. Nat. Mus.); Las Ánimas, alt. 200 m., *Shannon* (distrib. J. D. Sm.), n. 600 (hb. J. D. Sm.). HONDURAS: Rio Permejo, alt. 180 m., *Thieme* (distrib. J. D. Sm.), n. 5323 pro parte (hb. J. D. Sm.). COSTA RICA: Cartago, alt. 1300 m., "Santa Lucia incolarum," *Cooper* (distrib. J. D. Sm.), n. 5824 (hb. J. D. Sm.). NICARAGUA: Chinandega, *Baker*, n. 2021 (hb. Gray., hb. U. S. Nat. Mus.). SALVADOR: *Renson*, n. 190 (hb. U. S. Nat. Mus.). CUBA: prope villam Monte Verde dictam, *Wright*, 1310 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); in ripis, Cienfuegos, *Combs*, n. 59 (hb. Gray.). INSULA PINORUM: in silvis pinorum, *Palmer & Riley*, n. 1068 (hb. U. S. Nat. Mus.). PORTO RICO: *Sintenis*, nn. 59 (hb. U. S. Nat. Mus., hb. J. D. Sm.), 3661 (hb. J. D. Sm.), 5816 (hb. J. D. Sm.); *Heller*, nn. 542 (hb. U. S. Nat. Mus.), 6143 (hb. Gray., hb. U. S. Nat. Mus.); *Britton & Cowell*, n. 927 (hb. U. S. Nat. Mus.); *Underwood & Griggs*, nn. 871, 872 (hb. U. S. Nat. Mus.). ST. THOMAS: *Eggers*, n. 303 (hb. Gray., hb. J. D. Sm.). ST. CROIX: *Ricksecker*, nn. 430 (hb. Gray., hb. U. S. Nat. Mus.), 250 (hb. U. S. Nat. Mus.). MONTSERRAT: *Shafer*, n. 207 (hb. U. S. Nat. Mus.). GUADELOUPE: *Duss*, n. 2520 (hb. U. S. Nat. Mus.). MARTINIQUE: *Duss*, nn. 934, 4681 partim (hb. U. S. Nat. Mus.); *Hahn*, n. 1190 (hb. Gray., hb. U. S. Nat. Mus.). ST. VINCENTS: *H. H. & G. W. Smith*, n. 543 (hb. Gray.). GRENADA: *Broadway* (hb. Gray., hb. U. S. Nat. Mus.). BARBADOS: n. 124 legulo innom. (hb. Gray., hb. U. S. Nat. Mus.). COLUMBIA: Santa Marta, alt. 305 m., *H. H. Smith*, n. 523 (hb. Gray., hb. U. S. Nat. Mus.). VENEZUELA: prope Tovar, alt. 1980 m., *Fendler*, n. 652 (hb. Gray.). GUIANA ANGLICA: in terris litoreis, *Jenman*, n. 5398 (hb. J. D. Sm.). BOLIVIA: Mapiri, alt. 1525 m., *Rusby*, nn. 1642 (hb. U. S. Nat. Mus.), 1643 (hb. Gray.,

hb. J. D. Sm.), *Buchtien*, n. 1456 (hb. Gray.); Yungas, *Bang*, n. 407 (hb. U. S. Nat. Mus.). BRASILIA: in pascuis ruderatisque prope Rio de Janeiro, *Beyrich* (hb. Gray.); *Rudio* (hb. Gray., hb. Berol.); Petropolis, *Binot*, n. 15 (hb. Berol.); ex umbrosis juxta Tijuca, *Ball* (hb. U. S. Nat. Mus.); juxta Santos, *Ball* (hb. Gray.); Minas Geraës, *Regnell*, n. III 675 (hb. J. D. Sm.); Saõ Paulo, *Everett*, n. 16 (hb. Gray.); sine loco indicato, *Martius*, n. 672 (hb. Gray.), *Burchell*, n. 854 (hb. Gray.), *Luschnath* (hb. Gray.), *Riedel*, n. 1346 (hb. Gray.). INS. ST. HELENA: *Wilkes* (hb. U. S. Nat. Mus.). SIERRA LEONE: Freetown, *W. H. & A. H. Brown*, nn. 31a, 51 (hb. U. S. Nat. Mus.). AEGYPTO: prope Luxorem, *Kralik* (hb. Gray.), prope Girgeh, *Joad* (hb. U. S. Nat. Mus.). NUBIA: in insula Tutli ad urb. Chartum, *Kotschy*, n. 327 (hb. Gray.). AFR. ORIENT. GERMAN.: Kilima Njaro, *Abbott* (hb. U. S. Nat. Mus.); Usambara, *Holst*, n. 8860 (hb. U. S. Nat. Mus.). NYASSALAND: *Buchanan*, n. 740 (hb. U. S. Nat. Mus.). SANSIBAR: *Stuhlmann* (hb. Gray.). MADAGASCAR: Imerina, *Hildebrandt*, n. 3500 (hb. Gray., hb. U. S. Nat. Mus.); Nossi-be, *Hildebrandt*, n. 3304a (hb. J. D. Sm.); *Shufeldt*, n. 101 (hb. U. S. Nat. Mus.). CHINA: Meng-Tsze, *Henry*, n. 9094 (hb. U. S. Nat. Mus.); Canton, *Williams* (hb. Gray.); Hong Kong, *Wright* (hb. U. S. Nat. Mus.). IND. OR.: Sikkim, reg. subtrop., *Hooker f.* (hb. Gray.), Khasia, reg. subtrop., *Hooker f. & Thompson* (hb. Gray.); in locis incultis prope Mangalor, *Hohenacker*, n. 1 (hb. Gray.). ASSAM: Dumar Dallang, *Watt*, n. 10, 431 (hb. U. S. Nat. Mus.). SIAM: Bangkok, *Zimmermann*, n. 70 (hb. U. S. Nat. Mus.). BURMA SUPERIOR: a legulo cl. Kingii, n. 11 (hb. Gray.). MALACCA: *Cuming*, n. 2362 (hb. Kew., phot. in hb. Gray.). JAVA: *Zollinger*, n. 23 (hb. Gray.). INS. PHILIPPENSES: *Cuming*, n. 2419 (hb. Gray.); Manila, *Merrill*, n. 35 (hb. Gray.); Luzon, *Merrill*, n. 1955 (hb. Gray.), *Ramos*, n. 2086 (hb. Gray.); Cution, *Merrill*, n. 563 (hb. Gray.). INS. VITENSES: *Seemann*, n. 267 (hb. Gray.). INS. TONGENSES: *Moore*, n. 469 (hb. U. S. Nat. Mus.). INS. HAWAIIENSES: Oahu, *Remy*, n. 229 (hb. Gray.), *Drill* (hb. Gray.), *Heller*, n. 1999 (hb. Gray., hb. U. S. Nat. Mus.).

Forma **album** (Willd.), comb. nov., formae typicae habitu, foliis, etc., simillimum differt solum corollis albis.— *A. album* Willd. ex Steud. Nom. 18 (1821). *Carelia conyzodes* [L.] Ktze., *α robusta* Ktze., var. *alba* (Willd.) Ktze. Rev. Gen. i. 325 (1891), etiam *γ pusilla* Ktze., var. *alba* Ktze., l. c.— Cum forma typica late dispersa tamen multo rarior, e. g. Porto Rico: in graminosis ad "Cacoa," *Sintenis*, n. 5874 (hb. J. D. Sm.).

Var. INAEQUIPALEACEUM Hieron., formae typicae habitu, foliis, etc.,

simillimum differt pappi paleis valde inaequilongis, saepius 1–3 setiferis corollas subaequantibus, ceteris brevioribus squamiformibus muticis.— Hieron. in Engl. Bot. Jahrb. xix. 44 (1894).— COLUMBIA: ad Fusagasuga, *Holton* (hb. Kew.); prope Popayan, *Lehmann*, n. 4666 (hb. Berol., fragm. in hb. Gray.); in campis prope Chapa in prov. Cauca, alt. 1860 m. (fl. albis), *Lehmann*, n. 3600 (hb. Gray., hb. J. D. Sm.), n. 3601, fl. caeruleis (hb. Gray.). BOLIVIA: Yungas, *Bang*, n. 407 (hb. Gray.). PERUVIA: Lima, *Wilkes* (hb. U. S. Nat. Mus., hb. Gray.). INS. BAHAMENSES: ad Nassau, *Curtiss*, n. 77 (hb. Gray., hb. U. S. Nat. Mus.); Harbor Ins., *E. G. Britton*, n. 6375 (hb. U. S. Nat. Mus.). INSULA PINORUM: *Taylor*, n. 191 (hb. Gray., hb. U. S. Nat. Mus.). SANTO DOMINGO: in ripis fluminis Jaina, *Wright, Parry & Brummel*, n. 250 (hb. U. S. Nat. Mus.), n. 264 (hb. Gray., hb. U. S. Nat. Mus.).

NOTA.— Haec varietas in loco intermedio stat inter *A. conyzoidem* et *A. latifolium* et occurrit solum in regionibus ubi utraque species reparantur, numquam ut videtur in Africa, Asia, insulis Pacifici Maris, ubi *A. latifolium* deest. An forma hybrida?

7. A. SUFFRUTICOSUM Regel, perenne suffruticosum canescenti-pilosum; caule ramoso ad inflorescentiam folioso dense pubescenti; foliis oppositis vel supremis alternis rhomboideo-ovatis serrato-dentatis 3-nerviis attenuatis sed in apice vero obtusis basi abrupte contractis ad insertionem petioli tamen plus minusve cuneatis; corymbis trichotomis planiusculis multicapitulatis; capitulis multifloris; involucri squamis subaequalibus; corollis caeruleis; achaeniis argute angulatis leviter arcuatis in angulis minute sursum hispidulis; pappi paleis 5 ovato-lanceolatis dentatis in aristas ca. 3-plo longioribus disinentibus. — Gartenfl. iii. 389, t. 108 (1854). *Eupatorium nanum* Hort. ex Regel, l. c. 389. *Ageratum nanum* Hort. ex Sch. Bip. in Koch & Fint. Wochenschr. i. Garten-Nachtr. 26 (1858).— Species minus cognita a nobis non visa in hortis gallicis primo cultis origine ignota.

8. A. GAUMERI Robinson, annuum ad 4 dm. altum erectum vel reclinatum ramosissimum laxe pubescens; caule tereti; foliis oppositis graciliter petiolatis oblongo-ovatis crebre et regulariter serratis vel crenatis acuminatis basi rotundatis 3.5–7 cm. longis 2.5–5 cm. latis utrinque viridibus laxe subadpresseque villosis; inflorescentia perlaxa, pedicellis 2–4 (usque ad 6) cm. longis bracteolis paucis parvis subulatis munitis; capitulis numerosis pro genere majusculis oblate sphaericis 7–9 mm. diametro; involucri squamis linearibus attenuatis viridibus 2-costatis subaequalibus; receptaculo conico nudo; corollis glabris limbum versus caeruleo-purpureis, tubo proprio gracili fauces

distincte ampliatas cylindratas subaequanti; achaeniis nigris vix in angulis obscure hispidulis 1.2 mm. longis; pappi squamis 5 aliis saepissime brevioribus muticis aliis in aristam disinentibus et achaenium longitudine subaequantibus.— Proc. Am. Acad. xlvii. 191 (1911). *A. intermedium* Millsp. Field Columb. Mus. Pub. Bot. Ser. iii. 90 (1904), non Hemsl.— YUCATAN: Izamal, *Gaumer*, n. 395 (hb. Gray., hb. U. S. Nat. Mus.); Merida, *Valdez*, n. 13 (hb. Gray., hb. U. S. Nat. Mus.).

9. A. RUGOSUM Coult., erectum verisimiliter perenne; caule tereti sordide pubescenti purpurascenti ad inflorescentiam folioso superne ramoso 4 dm. vel. ultra alto; foliis ovatis attenuatis acutis serratis 3(–5)-nerviis 6–8 cm. longis 3.5–4.3 cm. latis supra scabriusculis rugulosis vel planis tenuiter pubescentibus subtus paullo pallidioribus pubescentibus et puncticulatis basi rotundatis; petiolo usque ad 1.5 cm. longo; corymbis terminalibus multicapitulatis 3–6 cm. diametro; capitulis 7 mm. diametro ca. 65-floris; involucri turbinato-campanulati squamis subaequalibus lanceolato-linearibus attenuatis uncinatis dorso 2-costatis hirsutis; receptaculo conico plerumque nudo margine solo paleis paucissimis instructo; corollis caeruleo-purpureis 2.5 mm. longis glandulari-granulosis supra mediam partem in fauces turbinato-campanulatas paullo ampliatis; achaeniis argute 5-angulatis deorsum decrescentibus nigris glaberrimis lucidis basi albido-callosis; pappo e paleis 5 saepius deltoideis brevibus (ca. 0.3 mm. longis) acutis vel obtusis et denticulatis basi per tertiam partem longitudinis connatis.— Bot. Gaz. xx. 42 (1895); J. D. Sm. Enum. Pl. Guat. iv. 72 (1895). *A. latifolium* Hemsl. Biol. Cent.-Am. Bot. i. 82 (1881) quoad pl. guatem.— GUATEMALA: Santa Rosa, alt. 915 m., *Heyde & Lux* (distrib. J. D. Sm.), n. 4243 (hb. J. D. Sm.); basi montis igniv. Fuego, *Salvin & Godman*, n. 48 (hb. Kew.); San Cristobal, alt. 1400 m., *v. Tuerckheim*, n. II 2051 (hb. Gray., hb. J. D. Sm.); alt. 1130 m., *Deam*, n. 6169 (hb. Gray.) et dubitatim n. 6208 (hb. Gray.)— forma foliis multo minoribus.

NOTA.— Ob pappo e squamulis basi connatis transitionem ad Subg. *Coelestinam* formans. Plantae nonnullae perplexantes occurrunt, e. g., San Salvador, *Velasco* (distrib. J. D. Sm.), n. 8967 (hb. J. D. Sm.), cum habitu passim *A. rugosi* sed cum pappo subintegro *A. corymbosi;* Guatemala, Alta Verapaz, *Goll.* n. 114 (hb. U. S. Nat. Mus., hb. J. D. Sm.), cum pappo *A. rugosi* sed foliis minoribus subtus dense canescenteque tomentosis. — Formae ultius inquirendae.

10. **A. platypodum**, spec. nov., robustum subglabrum; caule (basi ignoto) superne suberecto paucirameo folioso tereti purpurascenti crassiusculo paullo lignescenti tamen medulloso obscure puberulo tardius glabrato; foliis magnis ovatis obtuse acuminatis grosse crena-

tis oppositis supra viridibus obscure adpresseque pilosis subtus pallidioribus glaucescentibus in veniis parcissime pilosis 5–8 cm. longis 3–5 cm. latis basi subcuneatis in petiolum subdecurrentibus; petiolo 1–2 cm. longo obcompresso latiusculo supra late canaliculato paullo adpresse piloso vel subglabro; corymbis in caule et ramis terminalibus pedunculatis 7–12-capitulatis; pedicellis crispe puberulis 7–17 mm. longis; bracteolis setaceis; capitulis majusculis 8–9 mm. diametro; involucri late campanulati basi umbonati squamis oblongo-lanceolatis 1–2-costatis adpresse pilosulis; receptaculo nudo; corollis limbum versus purpureis extus hispidulis, tubo proprio gracili papilloso in fauces cylindratas subglabras sensim dilatato; achaeniis atrobrunneis vel nigrescentibus glabris nitidis 1.8 mm. longis basi callosis; pappi paleis 5–8 oblongis obtusis dentatis vel laciniatis 0.5 mm. longis.— MEXICO: ad Guadalajaram, *Palmer* (anno 1886), n. 437, pro parte (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.).

NOTA.—Species bene distincta cum *A. Houstoniano* tamen a legulo commixta et sub nomine *A. conyzoides*, var. *mexicanum* distributa, sed facile ob pappi paleis multo brevioribus, foliorum forma, etc., distinguenda.

11. A. LATIFOLIUM Cav., annuum erectum vel decumbens laxe pubescens 3–5 dm. altum; radice fibrosa; caule tereti striato viridi vel purpureo saltim ad nodos piloso; ramis arcuato-ascendentibus nudiusculis corymbiferis; foliis ovatis vel ovato-oblongis crenato-serratis obtusis basi rotundatis 2–5 cm. longis 1–3.5 cm. latis tenuibus utrinque parce pilosis subtus paullo pallidioribus impunctatis; petiolis 1–1.7 cm. longis pubescentibus; corymbis 5–8-capitulatis inaequaliter sed saepius longe pedunculatis, bracteis primariis foliaceis, bracteolis setaceis, pedicellis 2–6 mm. longis; capitulis ca. 6 mm. diametro ca. 40-floris; involucri squamis lanceolato-oblongis acutis 2-costatis subaequalibus viridibus vel purpurascentibus subglabris; corollis violaceis vel albis subglabris a media parte sensim ampliatis; achaeniis nigris in angulis minute sursum hispidulis vel glabris; pappi paleis oblongis vel ovatis vel lanceolatis muticis.— Ic. iv. t. 357 (1797). *Ageratum brachystephanum* Regel, Gartenfl. iii. 245, t. 108, fig. c (1854). *A. muticum* Griseb. Fl. Brit. W. Ind. 356 (1861). *A. maritimum* β Sch. Bip. ex Griseb. l. c. *Calea densiflora* Klatt, Leopoldina, xx. 96 (1884). *Carelia brachystephana* (Regel) Ktze. Rev. Gen. i. 325 (1891). *C. mutica* (Griseb.) Ktze. l. c.— MEXICO: Tepic, *Palmer* (anno 1892), n. 1834 (hb. Gray.). COSTA RICA: in sepi ad Turrialbam, alt. 200 m., *Tonduz*, n. 4139 (hb. J. D. Sm.). CUBA: in rupibus montium Farallonium, *Wright*, n. 1631 (hb. Gray.). INS. BAHAM.: Little Harbor Cay, *Britton & Millspaugh*, n. 2240 (hb. U. S. Nat. Mus.); Harbor Ins.,

E. G. Britton (hb. U. S. Nat. Mus.); secundum vias et in ruderis, *Wight*, n. 26 (hb. Gray.). SANTO DOMINGO: alt. 50 m., ad Paradis, *Fuertes*, n. 458 (hb. U. S. Nat. Mus.). JAMAICA: *March* (hb. Kew., phot. in hb. Gray.). COLUMBIA: *Triana*, n. 1157 (hb. Kew.). VENEZUELA: Caracas, *Wagener*, f. Regel., l. c. PERUVIA: prope Limam, *Née*, f. Cav. l. c., *Gaudichaud*, n. 106 (hb. Gray.).

NOMEN VULGATUM peruviorum *Teatina* ex Cav. l. c.

NOTA.— Ab vulgato *A. conyzoide* praecipue pappo breviori mutico ab auctoribus successivis sub nominibus diversis sejunctum quam species fortasse videndum, tamen in *A. conyzoidem*, var. *inaequipaleaceum* facillime et saepissime transiens.

NOTA.— Ad hanc speciem praeterea *Coelestinam parvifoliam* DC. Prod. v. 108 (1836), plantam minus cognitam ob speciminis typici axi frusto praecipue ab axibus lateralibus parvifoliatis descriptam confidenter refero.

Var. **galapageium**, var. nov., valde decumbens; foliis tenuissimis; capitulis plerisque minoribus 3–5 mm. diametro ca. 20-floris; pappi squamulis saepius (non semper) brevissimis vix 0.2 mm. longis.— *A. conyzoides* Hook. f. Trans. Linn. Soc. xx. 207 (1847); Anderss. Stockh. Akad. Handl. 1853, p. 175 (1854), et Om Galap. Veg. 67 (1857); Robinson & Greenman, Am. Jour. Sci. ser. 3, l. 146 (1895); Stewart, Proc. Calif. Acad. Sci. ser. 4, i. 148 (1911); non L. *Coelestina latifolia* Anderss. ll. cc. quoad plantam, nec Benth. *Ageratum latifolium* Robinson, Proc. Am. Acad. xxxviii. 209 (1902), quoad plantam, nec Hemsl.— INS. GALAPAGOS: Charles Insula, *Darwin*, *Andersson* (hb. Gray.), *Baur*, *Snodgrass & Heller*, n. 423 (hb. Gray.). Verisimiliter etiam in insulis Chatham et Albemarle, tamen pl. Chierchiae ex illa numquam vidi et pls. Stewartii ex utraque non critice revidi.

12. A. MARITIMUM HBK., herbaceum decumbens a basi ramosum parce pilosus 2.5–3.5 dm. altum annuum vel perenne; caule ramisque teretibus juventate viridibus striatulis per majorem partem foliosis aetate a cortice flavido-griseo exfolianti tectis; foliis oppositis ovato-oblongis vel anguste deltoideis obtusiusculis regulariter crenatis basi integris abrupte contractis subtruncatis vel subcordatis 1.5–3 cm. longis 9–22 mm. latis subglabris; petiolo 9–15 mm. longo gracili villoso-hirsutulo; pedunculis 2–11 cm. longis aut terminalibus aut lateralibus; cymis 3–5-capitulatis; capitulis ca. 7 mm. diametro ca. 75-floris; involucri squamis lanceolati-oblongis acuminatis viridibus 2-costatis glabriusculis; receptaculo leviter convexo nudo; corollis 3 mm. longis fere tubulatis in fauces vix ampliatis parce pubescentibus limbum versus violaceis (Kunth), caeruleis aut albis (Shafer), caeruleis aut roseis (Palmer & Riley), purpureis (Wright), breviter hispidulis; achaeniis nigris acute 5-angularibus 2.1 mm. longis glabris; pappo e

squamulis saepius 5 ovatis laciniatis acutis vix 0.3 mm. longis basi hinc inde plus minusve connatis.— Nov. Gen. et Spec. iv. 150 (1820). *Carelia maritima* (HBK.) Ktze. Rev. Gen. i. 325 (1891).— CUBA: arenosis maritimis prope Havanam, *Humboldt & Bonpland*, n. 1273 (hb. Par., phot. in hb. Gray.); *Curtiss*, n. 650 (hb. Gray., hb. U. S. Nat. Mus.); prope Mariel, Pinar del Rio, *Palmer & Riley*, n. 712 (fl. caeruleis, hb. U. S. Nat. Mus.), n. 739 (fl. roseis, hb. U. S. Nat. Mus.); Bay Corrientes, *Wright*, n. 1631 (hb. Gray.); Cayo Sabinal, Camaguey, *Shafer*, n. 1099 pro parte (hb. Gray., hb. U. S. Nat. Mus.).

Forma **calvum**, forma nova, achaeniis omnino epapposis ab annulo sub corolla nec extra corollam oriunti coronatis, aliter nullo modo a forma typica discretum.— CUBA: Cayo Sabinal, Camaguey, *Shafer*, n. 1099 pro parte (hb. Gray.); YUCATAN: in insula Cozumel, *Gaumer*, n. 20 (fl. albis, hb. Berol., hb. Gray.).

Var. **intermedium** (Hemsl.), comb. nov., formae typicae habitu foliis etc. simillimum differt pedunculis paullo longioribus (6–18 cm. longitudine); pappi squamulis distincte longioribus (ca. 0.7 mm. longitudine) aliis (1–3) setiferis aliis acutis sed muticis.— *A. intermedium* Hemsl. Biol. Cent.-Am. Bot. iv. 102 (1887).— YUCATAN: in insula Cozumel, *Gaumer*, n. 93 (hb. Kew., hb. Gray.).

NOTA.— *A. maritimum* quamquam a Hook. f. & Jacks. Ind. Kew. i. 58 (1895) ad vulgatissimum *A. conyzoidem* incaute reductum apparet speciminibus numerosis examinatis bene distinctum.

13. A. LITTORALE Gray, decumbens a basi ramosissimum 3–4 dm. altum subglabrum verisimiliter perenne; ramis teretibus pallide brunneis vel purpurascentibus basi saepius decumbentibus deinde erectis fere ad mediam partem foliosissimis superne nudis apice corymbiferis; foliis oppositis saepe fasciculatis rhombeis basi attenuatis integris aliter inciso-dentatis apice acutiusculis 11–27 mm. longis 10–14 mm. latis glaberrimis subcarnosis 3-nerviis saepe conduplicatis; petiolis gracillimis 9–25 mm. longis apicem versus paullo dilatatis; pedunculis 6–16 cm. longis; corymbis parvis densis 4–13-capitulatis; pedicellis brevibus cum bracteolis subulatis parvis munitis; capitulis 5 mm. diametro; involucri squamis anguste lanceolatis attenuatis acutissimis glabris 2-costatis; corollis 2.7 mm. longis limbum versus caeruleo-purpureis, tubo proprio minute puberulo fauces cylindratas pallidas subaequanti; achaeniis nigris glabris lucidis 1.3 mm. longis prismaticis basi callosis apice cum annulo humili cartilagineo saepius integro coronatis; pappo saepius vero nullo rarius e dentibus 2–5 brevissimis obscuris composito.— Proc. Am. Acad. xvi. 78 (1880), Syn. Fl. i. pt. 2, 93 (1884). *Coelestina maritima* Torr. & Gray, Fl. ii.

64 (1841), non *Ageratum maritimum* HBK. *Carelia litorale* [Gray] Ktze. Rev. Gen. i. 325 (1891).— In insulis parvis FLORIDAE AUSTRALIS: in litoribus corallinis, Key West, *Bennett; Blodget* (hb. Gray.); *Palmer* (anno 1874), n. 192; *Garber*, (hb. Gray, hb. U. S. Nat. Mus.); *Tweedy*, n. 312 (hb. U. S. Nat. Mus.); *Pollard, Collins & Morris*, n. 12 (hb. U. S. Nat. Mus.); Boca Chica Key, *Curtiss*, n. 1163 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); No Name Key, *Simpson*, n. 246 (hb. U. S. Nat. Mus.); Few-fish Key, *Curtiss*, n. 5446 (hb. U. S. Nat. Mus.); *Chapman*, n. 49 (hb. J. D. Sm.).

Var. **hondurense**, var. nov., formae typicae multis simillimum differt foliis paullo majoribus usque ad 34 mm. longis et 20 mm. latis potius regulariter crenato-dentato nec incisis; involucri squamis paullulo villosis.— In insulis sinus hondurensis: RUTAN, *Gaumer*, n. 1 (hb. Berol., hb. U. S. Nat. Mus.). MUGERES, *Gaumer* (hb. Berol., hb. U. S. Nat. Mus.).

Forma **setigerum**, forma nova, a forma precedenti statura habitu foliis etc. nullo modo discretum, pappo tamen bene evoluto squamulis 5 lanceolatis attenuatis aliis (saepius 3) longe setiferis corollam longitudine aequantibus aliis plus minusve brevioribus.— In insula MUGERES hondurensi, *Gaumer* (hb. Berol., hb. U. S. Nat. Mus.) cum precedenti commixtum et pappo solo distinguendum.

Sect. II. COELESTINA (Cass.) Gray. Pappus e corona sistens margine integra vel plus minusve angulata vel dentata (rarissime setam unicam gerenti) hinc inde valde reductus.— Syn. Fl. i. pt. 2, 93 (1884). *Coelestina* Cass. Bull. Soc. Philom. Par. 1817, p. 10 (1817). DC. Prod. v. 107 (1836), pro parte. *Caelestina* Cass. Dict. Sci. Nat. xvi. 10 (1820), lx. 585 (1830). *Coelestinia* Endl. Gen. 366 (1838). *Ageratum* subg. *Coelestina* (Cass.) Bak. in Mart. Fl. Bras. vi. pt. 2, 197 (1876), pro parte.— Species 14 omnes neontogeae pleraeque suffrutices.

Clavis specierum.

a. Receptaculum paleaceum *b.*
  b. Paleae apice firmiusculae subulato-attenuatae *c.*
    c. Corollae purpureo-caeruleae. Folia subtus tomentosa et cum glandulis flavis vel aureo-brunneis creberrime tecta. Mex. 14. *A. paleaceum.*
    c. Corollae albae. Folia subtus tomentosa sed sine glandulis conspicuis. Mex. ..... 15. *A. albidum.*
  b. Paleae oblongae vel lineares apice obtusae vel acutae neque induratae nec subulato-attenuatae. Bras. ..... 16. *A. micropappum.*
a. Receptaculum nudum *d.*
  d. Rhizoma bene evolutum horizontali repens. Inflorescentia laxe dichotoma scorpoideo-cymosa ..... 17. *A. scorpoideum.*

d. Rhizoma brevissimum vel nullum. Inflorescentia corymbosa, capitulis rariter solitariis terminalibus *e*.
e. Folia a basi alterna .....18. *A. stachyofolium.*
e. Folia saltim pleraque opposita *f*.
f. Maritimum basi valde ramosum decumbens glabriusculum 13. *A. littorale.*
f. Non maritima rariter basi ramosa. Caules pubescentes vel puberuli *g*.
g. Annuae *h*.
h. Folia quamquam membranacea tamen firmiuscula subtus distincte pallidiora et glanduloso-punctata. Am. Cent. et Venez. .....19. *A. Oerstedii.*
h. Folia tenuissima subconcoloria subtus eglandulosa 11. *A. latifolium.*
g. Herbae perennes vel frutices *i*.
i. Folia sesqui vel bis (rariter $2\frac{1}{2}$-plo) longiora quam lata *j*.
j. Folia subtus incano-tomentosa.....20. *A. tomentosum.*
j. Folia opaca utrinque griseo-pubescentia vel -tomentosa. Capitula saepius parvula *k*.
k. Involucrum 6–8 mm. diametro et altitudine. Achaenia 2.1–2.4 mm. longa *l*.
l. Folia basi valde obliqua. Involucri squamae in linea media ciliatae aliter glabrae extimis calloso-obtusis. Costa Rica.....21. *A. riparium.*
l. Folia basi aequalia. Involucri squamae crispe puberulae acutissimae. Mex.....22. *A. corymbosum.*
k. Involucrum ca. 4 mm. diametro vix 3 mm. altitudine. Achaenia 1.6 mm. longa. Guatemala 23. *A. elachycarpum.*
j. Folia supra laete viridia modice lucida fere glabra subtus vix pallidiora saepius scabriuscula. Capitula pro genere majuscula *m*.
m. Petioli 3–4 cm. longi.....24. *A. petiolatum.*
m. Petioli breviores *n*.
n. Herbaceum vel lignescens. Folia crenata. Corollae caeruleae .....25. *A. scabriusculum.*
n. Fruticosum. Folia acute serrata. Corollae albae 26. *A. lucidum.*
i. Folia angustiora triplo usque ad quintuplo longiora quam lata 27. *A. salicifolium.*

14. A. PALEACEUM (Gay) Hemsl., herbaceum vel basi lignescens erectum ramosum; caule tereti brevissime crispeque griseo-tomentello; ramis oppositis virgatis foliatis saepius atropurpureis griseo-tomentellis; foliis oppositis breviter petiolatis ovato-lanceolatis crassiusculis integriusculis vel obscure dentatis acutiusculis basi etiam attenuatis supra scabris rugosis subtus reticulatis in nerviis et venis griseo-tomentosis in superficie cum glandulis perpluribus aureis vel flavido-brunneis obtectis; corymbis terminalibus multicapitulatis densis; pedicellis brevibus saepius rectis densissime glandulari-puberulis; capitulis ca. 25-floris 5 mm. diametro; involucri squamis anguste lanceolatis firmiusculis sed laxe imbricatis apice subulato-attenuatis

albidis dorso viridibus vel atropurpureis; receptaculo ubique paleifero; paleis apice subulato-attenuatis firmiusculis albidis corollas fere aequantibus; corollis extus glandulis aureis sessilibus conspicue conspersis limbum versus caeruleo-purpurascentibus, tubo proprio gracili fauces subaequanti; achaeniis glabris nigris 1.8 mm. longis; pappo crateriformi albido margine subintegro vel plus minusve dentato (hinc inde in setam expanso f. DC.).— Biol. Cent.-Am. Bot. ii. 83 (1881). *Coelestina paleacea* Gay ex DC. Prod. v. 107 (1836). *Carelia paleacea* (Gay) Ktze. Rev. Gen. i. 325 (1891). *Ageratum rhytidophyllum* Robinson, Proc. Am. Acad. xxxvi. 476 (1901).— MEXICO: circa Oaxacam, *Andrieux*, n. 287 (hb. DC., phot. in hb. Gray.); in convalli Oaxacanae, *E. W. Nelson*, n. 1446 (hb. Gray.); Sierra de San Filipe, alt. 2150 m., *Pringle*, n. 5675 (hb. Gray.), *C. L. Smith*, n. 594 (hb. U. S. Nat. Mus.), alt. 2440 m., *Pringle*, n. 6177 (hb. U. S. Nat. Mus., hb. J. D. Sm.); in montibus San Juan del Estado, *L. C. Smith*, n. 277 (hb. Gray.).

15. A. ALBIDUM (DC.) Hemsl., herbaceum perenne 3–6 dm. altum; caudice crassiusculo paullo lignescenti; radicibus fibrosis longis firmis; caulibus 1–3 vel pluribus teretibus striatulis viridibus vel purpurascentibus erectis vel plus minusve decumbentibus crispe griseo-tomentellis usque ad mediam partem foliosis superne nudis; foliis ovatis vel ovato-oblongis 3-nerviis crenato-serratis plerisque obtusis basi plus minusve angustatis 2.5–6 cm. longis 1.5–3.8 cm. latis supra viridibus rugosis saepius scabris subtus griseo-tomentellis vel -pubescentibus plus minusve reticulatis, glandulis paucis inconspicuis argenteis vel nullis; petiolis 3–5 mm. longis; pedunculo terminali elongato 1–3 dm. longo; bracteolis saepius parvis setaceis; corymbis leviter convexis 8–40-capitulatis 4–7 cm. diametro; capitulis 6–9 mm. diametro ca. 60-floris; involucri squamis lanceolatis acutis subaequalibus (extimis paucis brevioribus) viridibus dorso pubescentibus et hinc inde minutissime nigro-punctatis saepius 2-costatis apice albidis subulatis; receptaculo conico ubique paleifero; paleis linearibus apice subulatis albidis; corollis albis 2.7 mm. longis, tubo proprio gracili hispidulo fauces cylindratas glabriusculas subaequanti; limbi dentibus extus hispidulis; achaeniis 1.8 mm. longis saepius arcuatis nigris glabris lucidis; pappo crateriformi albo ca. 0.4 mm. alto margine denticulato.— Biol. Cent.-Am. Bot. ii. 81 (1881). *Coelestina albida* DC. Prod. v. 107 (1836). *Carelia albida* (DC.) Ktze. Rev. Gen. i. 325 (1891).— MEXICO: Oaxaca, inter urbem Oaxacam et Mitlam, *Andrieux*, n. 543 (hb. DC., phot. in hb. Gray.); in valle Etla, *Alvarez*, n. 751 (hb. Gray.); in collibus supra Oaxacam, alt. 1830 m., *Pringle*, n. 4816 (hb. Gray., hb.

U. S. Nat. Mus., hb. J. D. Sm.); in monte Alban prope urbem Oaxacam, alt. 1680–1830 m., *C. L. Smith*, n. 365 (hb. U. S. Nat. Mus.); Tecrango, alt. 2075 m., *L. C. Smith*, n. 424 (hb. Gray.); Cerro de San Felipe, alt. 2000 m., *Conzatti & González*, n. 542 (hb. Gray.); in collibus aridis vallis Oaxacae, alt. 1550–1770 m., *Nelson*, n. 1208 (hb. Gray.).

Var. **Nelsonii**, var. nov., caulibus altius foliosis; foliis majoribus tenuioribus late ovatis basi rotundatis utrinque viridibus subtus vix pallidioribus molliter pubescentibus nec tomentosis 6–11 cm. longis 2.5–4.5 cm. latis; petiolis usque ad 2 cm. longis; involucro, paleis, pappo, etc. ut apud formam typicam; corollis ut videtur caerulescentibus.— MEXICO: in civitate Oaxaca inter oppida Zanatepec et Papana, alt. 200 m., *E. W. Nelson*, n. 2822a (hb. Gray.). Varietas vegetior fortasse quam species distincta videnda tamen sine characteribus validis.

16. A. MICROPAPPUM Bak., fruticosum; ramis virgatis striato-angulatis crispe puberulis et glanduloso-atomiferis, internodiis 5–11 cm. longis; foliis oppositis obovato-oblongis coriaceis argute serrato-dentatis apice rotundatis basi attenuatis 4–8 cm. longis 2–4 cm. latis supra viridibus glabriusculis laevibus subtus reticulato-venosis pallidioribus griseo-tomentellis; petiolo ca. 6 mm. longo supra canaliculato; corymbis terminalibus densissimis convexis ca. 4 cm. diametro; capitulis ca. 20-floris ca. 3 mm. diametro; involucri campanulati squamis oblongis apice rotundatis dorso saepissime 2-costulatis margine tenui ciliatis; paleis lineari-oblongis obtusis apice ciliolatis vel erosis; achaeniis glabris nigrescentibus prismaticis deorsum levissime decrescentibus basi callosis; pappo brevissimo coroniformi dentato; corollis fere exacte cylindratis glabris, faucibus vix ullis.— Bak. in Mart. Fl. Bras. vi. pt. 2, 198 (1876).— BRASILIA: prov. Bahia, *Blanchet*, n. 3700 (hb. Kew., hb. Gray.).

17. A. SCORPIOIDEUM Bak., herbaceum perenne subglabrum; rhizomate horizontali valde repente ad nodos radicante; caulibus erectis 3–4 dm. altis per totam longitudinem foliosis; foliis lanceolatis tenuibus penniveniis crenatis basi apiceque angustatis obtusis ca. 5 cm. longis 1 cm. latis; inflorescentiis terminalibus semel vel bis dichotomis deinde scorpioideo-cymosis; capitulis parvis graciliter pedicellatis vel supremis subsessilibus 4–5 mm. diametro 18–31-floris; involucri squamis late oblanceolatis acutis glabris tenuibus subcostatis; receptaculo nudo; corollis 1.8 mm. longis glabris, tubo proprio brevissimo faucibus campanulatis duplo breviori; achaeniis 1.3 mm. longis nigris glabris prismaticis deorsum paullo decrescentibus basi callosis;

pappo coroniformi dentato tenui quam achaenio ter vel quater breviori.— Bak. in Mart. Fl. Bras. vi. pt. 2, 197 (1876); Robinson, Proc. Am. Acad. xlii. 34 (1906). *Coelestina repens* Sch. Bip. in Schomb. Faun. et Fl. Guy. 1134 (1848), sine char.— GUIANA ANGLICA: in graminosis verisimiliter plus minusve paludosis "savannas" dictis, *Rob. Schomburgk*, n. 353 f. Bak. l. c., *Rich. Schomburgk*, n. 488 (hb. Berol., fragm. et phot. in hb. Gray.).

18. A. STACHYOFOLIUM Robinson, herbaceum perenne 5–6 cm. altum strictum; caule simplici erecto tereti rubescenti griseo-tomentello foliosissimo; foliis alternis ovato-oblongis vel ellipticis crenulatis 1.5–3.2 cm. longis 1–1.4 cm. latis basi rotundatis sessilibus vel brevissime petiolatis apice obtusis vel rotundatis paullo supra basin 3-nerviis supra parce pilosis subtus paullo pallidioribus laxe pubescentibus et glandulari-punctatis; corymbo terminali leviter convexo ca. 10-capitulato 4 cm. diametro; pedicellis 1.5–1.8 cm. longis tomentellis; bracteolis spatulato-filiformibus 8–11 mm. longis; capitulis ca. 1 cm. diametro ca. 100-floris involucri squamis linearibus acutis viridibus pubescentibus saepius 4-costatis; corollis albis, tubo proprio longiusculo puberulo, faucibus turbinatis; styli ramis pallidis clavellatis; achaeniis atrobrunneis 2 mm. longis basin versus paullo decrescentibus; pappo crateriformi albido margine integro.— MEXICO: Oaxaca prope La Parada, alt. 2310–2620 m., *Nelson*, n. 991 (hb. Gray.). Species ob foliis omnibus alternis pedicellis longis capitulis majusculis praesertim ob involucri bracteis 4-costatis bene distincta.

19. **A. Oerstedii**, nom. nov., herbaceum annuum erectum simplex vel patentim paucirameum glabriusculum vel saltim ad nodos hirsutulum 3–5 dm. altum; radice fibrosa; foliis ovatis vel ovato-oblongis crenatis obtusis vel obtuse acuminatis basi abrupte contractis utrinque sparse pilosis supra viridibus subtus pallidioribus glanduloso-punctatis 4–7 cm. longis 2–5 cm. latis, petiolo 1–2 cm. longo piloso; corymbis longipedunculatis caulem ramosque terminantibus laxiusculis paucicapitulatis; capitulis 7.5 mm. diametro; involucri squamis viridibus sparse hirtellis vel glabriusculis anguste lanceolatis attenuatis; corollis caeruleo-purpureis glabris ca. 2.2 mm. longis, tubo proprio fauces cylindratas paullo ampliatas vix aequanti; achaeniis nigris glabris; pappo minimo coroniformi dentato obscuro sed sub lente forte manifestim extra corollam locato.— *A. latifolium* (Benth.) Hemsl. Biol. Cent.-Am. Bot. ii. 82 (1881), quoad pl. costaricense, non Cav. *Coelestina latifolia* Benth. in Oerst. Vidensk. Meddel. 1852, p. 71 (1852). *Carelia latifolia* (Benth.) Ktze. Rev. Gen. i. 325 (1891).—COSTA RICA: in Monte Aguacate, *Oersted*, n. 251 (hb. Kew., phot. in hb. Gray.);

in apertis silvarum, Cerro de San Isidro prope San Ramon, alt. 1300 m., *Brenes*, n. 14,491 (hb. Gray.).

20. A. TOMENTOSUM (Benth.) Hemsl., herbaceum perenne vel suffruticosum basi ramosum; ramis virgatis vel iterum ramosis puberulis vel tomentellis; foliis oppositis ovatis vel deltoideis crenatis plerisque obtusis basi rotundatis vel truncatis ad insertionem petioli plus minusve cuneatis supra saepius viridibus tenuiter pubescentibus vel tomentellis subtus canescenti-tomentosis 1.3–3.5 cm. longis 1–2.5 cm. latis margine saepe revolutis; petiolis 5–16 mm. longis; corymbis longe pedunculatis convexis densis subsimplicibus vel compositis; capitulis ca. 5 mm. diametro; involucri campanulati squamis anguste lanceolatis tomentellis viridibus 2-costatis; corollis caeruleo-purpureis vel albis plerisque glandulari-atomiferis et apicem versus hispidulis; achaeniis atrobrunneis glaberrimis 2 mm. longis; pappo albido coroniformi margine plus minusve angulato vel dentato.— Biol. Cent.-Am. Bot. ii. 82 (1881). *Coelestina tomentosa* Benth. in Oerst. Vidensk. Meddel. 1852, p. 71 (1852). *Carelia tomentosa* (Benth.) Ktze. Rev. Gen. i. 325 (1891).— COSTA RICA: Candelaria, alt. 1525 m., *Oersted.* MEXICO: Chiapas, in silvis pinorum, *Ghiesbreght*, nn. 111, 547 (hb. Gray.), forma foliis majusculis; Orizaba, Maltrata, alt. 1680 m., *Seaton*, n. 346 (hb. Gray., hb. U. S. Nat. Mus.); Esperanza, alt. 2440 m., *Seaton*, n. 358 (hb. Gray., hb. U. S. Nat. Mus.); Vera Cruz, *Linden*, n. 1185 (hb. Kew., phot. in hb. Gray.); silvis prope Jalapam, *Galeotti*, n. 2202 (hb. Kew., phot. in hb. Gray.); Puebla, in declivibus calcareis, Tehuacan, alt. 1700–1800 m., *Pringle*, n. 6754 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.), n. 9522 (hb. Gray., hb. U. S. Nat. Mus.), *Purpus*, n. 1179 (hb. Gray.); Zacuapan, in graminosis aridis, *Purpus*, n. 1870 (hb. Gray.). Sierra de la Yerba, *Purpus*, n. 2547 (hb. Gray., hb. U. S. Nat. Mus.), forma receptaculo paleis paucis instructo; Oaxaca, Tomellin Cañon, alt. 915 m., *Pringle*, n. 5786 (hb. Gray.); collibus aridis alt. 1550–1775 m., *Nelson*, n. 1213 (hb. Gray.); Jayacatlan, alt. 1300 m., *L. C. Smith*, 285 (hb. Gray.); in Monte Alban prope urbem Oaxacam, alt. 1680 m., *Pringle*, n. 6267 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); San Luis Potosi, Minas de San Rafael, *Purpus*, n. 4814 (hb. Gray., hb. U. S. Nat. Mus.).

NOTA.— Species foliis et pubescentia variabilis, formis mexicanis a forma typica costaricense minus cognita adhuc ut videtur numquam reperta fortasse distinguendis.

21. **A. riparium**, spec. nov., caule (parte inferiori ignota) superne medulloso crassiusculo glabello tactu laevissimo purpurascenti, internodiis longis folia superantibus; foliis oppositis crassiusculis

ovatis longiuscule acuminatis sed ad apicem verum obtusis basi plus minusve angustatis valde inaequalibus et obliquis margine undulatis supra scabriusculis subglabris verucosis subtus paullo pallidioribus punctatis et breviter praesertim in veniis pilosulis ca. 8 cm. longis ca. 4 cm. latis; petiolis ca. 1 cm. longis; corymbis in caule ramisque terminalibus 4–8-capitulatis densis; capitulis 7 mm. diametro 70-floris; involucri campanulati squamis ca. 23 subaequalibus lanceolati-linearibus 2-costatis viridibus in linea media (inter costas) ciliatis aliter subglabris extimis calloso-obtusis interioribus attenuatis; receptaculo conico nudo; corollis albis glaberrimis eglandulosis, tubo proprio gracili fauces cylindratas subaequanti; achaeniis nigrescentibus saepius curvatis glaberrimis vel basin versus in angulis obscure hispidulis; pappi corona ad mediam partem 5-lobata, lobis plerisque deltoideo-ovatis muticis margine denticulatis.— *A. tomentosum* Klatt, Bull. Soc. Bot. Belg. xxxi. 185 (1892), pro parte, non Hemsl. (a quo longe distat).— Costa Rica: in arenosis secundum flumen Ceibo, *Pittier*, n. 4914 (hb. Gray.).

Nota.— Haec planta minus cognita (an abnormalis) differt ab *A. corymboso* caule ut videtur herbaceo, foliis basi obliquis, involucri squamis laevioribus extimis calloso-obtusis, corollis glaberrimis, ab *A. scabriusculo* foliis multo majoribus basi obliquis, corollis albis, characteribus involucri, ab *A. tomentoso* toto coelo.

22. A. corymbosum Zuccag., suffruticosum vel vero fruticosum erectum vel saepe decumbens 3–7 dm. altum simplex vel ramosum plus minusve griseo-pubescens vel -tomentosum; foliis oppositis vel supremis alternis firmiusculis ovatis vel rhomboideo-lanceolatis plerisque acutis basi rotundatis vel cuneatis margine grosse crenatis vel dentatis rarius serratis a basi 3(–5)-nerviis saepe reticulatis 3–6 cm. longis 1–3.5 cm. latis utrinque pallide viridibus supra saepius scabris puberulis subtus molliter crispe puberulis vel plus minusve tomentosis; petiolis 4–8 mm. longis; corymbis in caule ramisque terminalibus saepe pluribus simplicibus vel compositis multicapitulatis; pedicellis filiformibus 3–12 mm. longis glandulari-tomentellis; capitulis ca. 7 mm. diametro; involucri campanulati vel hemisphaerici squamis lanceolato-linearibus attenuatis hispidulis 2-costatis apicem versus saepe coloratis; receptaculo nudo; corollis extus parce glandulari-atomiferis et saepius plus minusve pubescentibus limbum versus caeruleis et vulgo hispidulis, tubo proprio gracili fauces paullo ampliatas subaequanti; achaeniis 2.2 mm. longis atrobrunneis vel nigrescentibus glabris; pappo crateriformi 0.3 mm. longo albido margine subintegro vel paullo irregulariterque dentato.— Zuccag. ex Pers. Syn. ii. 402 (1807). *Spargano-*

phorus ageratoides Lag. Elench. Hort. Matr. 25 (1815) f. Hemsl. Biol. Cent.-Am. Bot. ii. 81 (1881) et Lag. Nov. Gen. et Spec. 25 (1816). *Ageratum coelestinum* Sims, Bot. Mag. t. 1730 (1815). *Caelestina coerulea* Cass. Dict. vi. Suppl. 8 (1817). *Coelestina corymbosa* (Zuccag.) DC. l. c. *C. suffruticosa* Sweet, Hort. Brit. 229 (1826). *Coelestinia Lessingiana* Klotzsch ex Walp. Rep. ii. 545 (1843) f. Hook. f. & Jacks. Ind. Kew. i. 370 (1895) sub nomine *Caelestina*. *Coelestina Lessingiana* (Klotzsch) Hemsl. Biol. Cent.-Am. Bot. ii. 81 (1881). *Carelia corymbosa* (Zuccag.) Ktze. Rev. Gen. i. 325 (1891).— TEXAS OCCIDENT.: ad angustas Guadelupe, *Wright*, n. 1129 (hb. Gray., hb. U. S. Nat. Mus.). MEXICO: Nuevo Leon, ad Monclovam, *Palmer* (anno 1880), n. 427 (hb. Gray., hb. J. D. Sm.); Coahuila, Saltillo, *Palmer* (anno 1880), n. 428 (hb. Gray., hb. U. S. Nat. Mus.), *Palmer* (anno 1898), n. 307 (hb. Gray.), in Lorenzo Cañon prope Saltillo, *Palmer* (anno 1904), n. 387 (hb. Gray.), Sierra de Parras, *Purpus*, n. 4651 (hb. Gray., hb. U. S. Nat. Mus.); Chihuahua, ad Cosihuiriachi, *Wislizenus*, n. 181 (hb. Gray.), prope urbem Chihuahuam, *Pringle*, n. 669 partim (hb. U. S. Nat. Mus.), Porral, alt. 1830 m., *Nelson*, n. 5006 (hb. Gray.); San Luis Potosi, alt. 1830–2440 m., *Parry & Palmer*, n. 317 (hb. Gray., hb. U. S. Nat. Mus.) ad var. *jaliscense* spectans, *Ward* (hb. U. S. Nat. Mus.), in umbrosis circa urbem, *Schaffner*, n. 293 (hb. Gray.), ad Santa Maria del Rio, *Palmer* (anno 1904), n. 154½ (hb. Gray.); Guanajuato, *Guillemin-Tarayre* (hb. Gray.), *Dugès*, nn. 24, 426 (hb. Gray.); Durango, in montibus et collibus, *Palmer* (anno 1896), n. 506 (hb. Gray., hb. U. S. Nat. Mus.) ad var. *jaliscense* accedens, Tejamén, *Palmer* (1906), n. 486 (hb. Gray., hb. U. S. Nat. Mus.); Hidalgo, Real del Monte, *Coulter*, n. 247 (hb. Gray.), in petrosis montanis ad El Chico, *Purpus*, n. 1565 (hb. Gray.); Sinaloa, in Cerro Colorado ad Culiacan, *Brandegee* (hb. Gray.), forma glabrescens; Jalisco, ad Balaños, *Coulter*, n. 248 (hb. Gray.), Guadalajara, *Palmer* (anno 1886), n. 289 (hb. Gray. partim, hb. U. S. Nat. Mus., hb. J. D. Sm.); Querétaro, prope Cadereytam, *Rose, Painter & Rose*, n. 9631 (hb. Gray.); Val. de Mexico, *Bourgeau*, n. 719 (hb. Gray., hb. U. S. Nat. Mus.), in terra vulcanica, alt. 2440 m., *Pringle*, n. 9047 (hb. Gray.), prope Tacubayam, *Schaffner*, n. 202 (hb. Gray.); sine loco indicato, *Gregg*, n. 372 (hb. Gray.), *Schumann*, n. 40b (hb. J. D. Sm.).

NOMEN VULGATUM hispanice "cielitos" f. Dugèsii i. e. caelula, ad colorem azureum alludens.

Forma **album**, forma nov., corollis albis aliter formae typicae simile et aequaliter variabile.— MEXICO: Jalisco, prope Huejuquilla,

Rose, n. 2538 (hb. Gray.); Puebla, in collibus calcareis prope Amozac, alt. 2300 m., *Pringle*, n. 9542 (hb. Gray.) glabriusculum; Chihuahua aust.-occ., *Palmer* (anno 1885), n. 31 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.) griseo-tomentosum, prope urbem Chihuahuam, *Pringle*, n. 669 partim (hb. Gray., hb. J. D. Sm.).

Var. **latifolium** (DC.), comb. nov., erectum saepius simplex; foliis ovatis magnis 7–10.5 cm. longis 4–6 cm. latis gradatim acuminatis acutis acute serratis plerumque tenuibus vix vel haud reticulatis subtus tenuiter molliterque pubescentibus; corollis glandulosis et pilosis caeruleis.— *Coelestina ageratoides* HBK. Nov. Gen. et Spec. iv. 151 (1820)! et var. *β latifolia* DC. Prod. v. 108 (1836)! — MEXICO: sine loco indicato (hb. DC., phot. in hb. Gray.); Michoacan, inter Aguasarco et Ario, *Humboldt & Bonpland* (hb. Par., phot. in hb. Gray.); collibus aridis, Patzcuaro, *Pringle*, n. 3599 (hb. Gray.); Morelos, in valleculis praeruptis montanis prope Cuernavacam, *Pringle*, n. 9843 (hb. Gray., hb. U. S. Nat. Mus.); *Holway*, n. 3509 (hb. Gray.); Yautepec, *Holway*, n. 5235 (hb. Gray.); Sinaloa, Lodiego, *Palmer* (anno 1891), n. 1587 (hb. Gray., hb. U. S. Nat. Mus.).

Forma **albiflorum**, forma nov., precedenti simillimum differt corollis albis.— MEXICO: Morelos, in collibus prope Yautepec, alt. 1220 m., *Pringle*, n. 9842 (hb. Gray., hb. U. S. Nat. Mus.).

Var. **euryphyllum**, var. nov., foliis late ovatis vel rhomboideo-ovatis obtusis grosse crenatis 4–6 cm. longis 3–4 cm. latis; corollis caeruleis glandulosis vix pilosis.— MEXICO: San Luis Potosi, alt. 1830–2440 m., *Parry & Palmer*, n. 315 (hb. Gray., hb. U. S. Nat. Mus.), n. 318 (hb. Gray., hb. U. S. Nat. Mus.), prope Alvarez, *Palmer* (anno 1902), n. 101 (hb. Gray., hb. U. S. Nat. Mus.); Nuevo Leon, Monclova, *Palmer* (anno 1880), n. 427 (hb. U. S. Nat. Mus.); Zacatecas, in montibus prope Plateado, *Rose*, n. 2739 (hb. Gray.); sine loco indicato, *Hartweg*, n. 142 (hb. Gray.).

Var. **jaliscense**, var. nov., foliis elliptico-lanceolatis breviter petiolatis 6–8 cm. longis 2.3–3 cm. latis grosse serratis vel crenato-dentatis vel etiam lobulatis firmiusculis scaberrimis reticulatis; corollis caeruleis glandulosis parce pilosis.— MEXICO: Jalisco ad Chapalam, *Palmer* (anno 1886), n. 715 (hb. Gray., hb. U. S. Nat. Mus.).

Forma **lactiflorum**, forma nov., precedenti simillimum differt corollis albis.— MEXICO: Jalisco, ad Tequilam, *Palmer* (anno 1886), no. 351 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.), ad Guadalajaram, n. 290 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.), via inter Huejuquilla et Mesquitec, *Rose*, n. 2585 (hb. Gray.).

Var. **longipetiolatum**, var. nov., foliis elongatis lanceolato-

triangularibus attenuatis basi plus minusve cuneatis integris supra basin grosse dupliceque crenato-dentatis ca. 8–10 cm. longis 3–4 cm. latis tenuibus non reticulatis subtus molliter tomentosis; petiolis usque ad 3 cm. longis; corollis glabriusculis albis.— MEXICO: in Chihuahua aust.-occ., *Palmer* (anno 1885), n. 110 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.).

Var. **subsetiferum**, var. nov., fruticosum ramosum; foliis ovatis 2–4 cm. longis 1.5–2.5 cm. latis obtusis vel acutiusculis crenato-serratis basi cuneato-angustatis brevissime petiolatis utrinque dilute viridibus scabridis; capitulis pro specie longiusculis; corollis caeruleis ex involucro valde exsertis; pappi corona flosculorum nonnullorum cum seta laevi corollam subaequanti instructa.— MEXICO: Zacatecas, prope Conception del Oro, *Palmer* (anno 1902), n. 382 (hb. Gray., hb. U. S. Nat. Mus.).

23. **A. elachycarpum**, spec. nov., fruticulosum gracile; caule tereti 1–2 mm. diametro a cortice griseo-brunnea tecto; ramis virgatis purpurascentibus crispe puberulis usque ad inflorescentiam foliosis; foliis oppositis tenuibus ovatis plerisque attenuato-acuminatis regulariter crenato-serratis 3-nerviis supra badio-viridibus pilosulis subtus pallidioribus griseo-tomentellis ca. 5 cm. longis ca. 2.5 cm. latis; corymbis compositis planiusculis; pedicellis 1–4 mm. longis; bracteolis setaceis; involucri hemisphaerici 4–5 mm. diametro 2.5–3 mm. alti squamis anguste lanceolatis attenuatis 2-costatis dorso crispe puberulis; corollis involucrum vix superantibus glandulari-atomiferis vix vel nullo modo pilosulis apicem versus violaceis; tubo proprio fauces campanulatas subaequilongo; achaeniis nigris 1.6 mm. longis glabris nitidis; pappi corona 0.2 mm. alta fere ad mediam partem 5-dentata albida.— *A. corymbosum* J. D. Sm. Enum. Pl. Guat. iv. 72 (1895), non Benth.— GUATEMALA: Santa Rosa, alt. 915 m., *Heyde & Lux* (distrib. J. D. Sm.), n. 4228 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.). Species *A. corymboso* gracilior differt etiam textura molliori foliorum, capitulis minoribus crassioribus quam altis, achaeniis multo minoribus, etc.

24. A. PETIOLATUM (Hook. & Arn.) Hemsl., perenne herbaceum vel suffruticosum ascendens foliosum; foliis oppositis vel supremis alternis ovatis obtusiusculis firmis glaberrimis crenato-serratis basi angustatis ad petioli insertionem cuneatis 6–9 cm. longis 2.5–4 cm. latis; petiolis gracilibus usque ad 3.6 cm. vel ultra longis; pedunculis longis terminalibus; corymbis parvis pauci-capitulatis; pedicellis erectis ad 2 cm. longis; bracteolis setaceis; capitulis 8 mm. diametro; involucri campanulati squamis anguste lanceolatis; corollis glaberri-

mis; pappo crateriformi dentato, dente uno hinc inde setifero ceteris vel omnibus muticis.— Biol. Cent.-Am. Bot. ii. 83 (1881). *Caelestina petiolata* Hook. & Arn. Bot. Beechy, 433 (1841). *Carelia petiolata* (Hook. & Arn.) Ktze. Rev. Gen. i. 325 (1891).— NICARAGUA: ad Realejo, *Sinclair* (hb. Kew., phot. in hb. Gray.). Species ut videtur numquam reperta, ob dentibus pappi hinc inde setiferis transitionem ad Sect. *Euageratum* monstrat.

25. A. SCABRIUSCULUM (Benth.) Hemsl., perenne herbaceum vel suffruticosum decumbens plus minusve ramosum 1.3–9 dm. altum primo aspectu glaberrimum tamen tactu plus minusve scabrum et vero minute pilosiusculum; caule ramisque gracilibus ascendentibus curvatis vel flexuosis foliosis; foliis oppositis ovatis saepius acuminatis serratis firmiusculis supra laete viridibus lucidis subtus dilutiore viridibus opacis punctatis 2–5 cm. longis 1–3.5 cm. latis; petiolis 5–11 mm. longis glandulari-pubescentibus; corymbis (1–)3–7-capitulatis simplicibus vel compositis longe pedunculatis; pedicellis filiformibus puberulis saepius ca. 1 cm. longis; capitulis ca. 7 mm. diametro ca. 75-floris; involucri squamis angustis acutissimis viridibus 2-costatis dorso crispe puberulis vel glabriusculis; corollis glaberrimis limbum versus caeruleis, tubo gracili fauces cylindratas subaequanti; achaeniis nigrescentibus glabris ca. 2 mm. longis; pappo crateriformi albido saepius 5-dentato 0.3 mm. longo.— Biol. Cent.-Am. Bot. ii. 83 (1881). *Coelestina corymbosa* Benth. Bot. Sulph. 111 (1844), pro parte, non DC. *C. scabriuscula* Benth. ex Oerst. Vidensk. Meddel. 1852, p. 72 (1852). *Carelia scabriuscula* (Benth.) Ktze. Rev. Gen. i. 325 (1891).— MEXICO: inter San Blas et Tepic, *Sinclair* (hb. Kew., phot. in hb. Gray.). GUATEMALA, *Friedrichsthal* f. Oerst. l. c. 73. COSTA RICA: in graminosis declivitatis occidentalis montis ignivomi El Vieja, alt. 610 m., *Oersted* (hb. Kew., phot. in hb. Gray.). NICARAGUA: *Wright* (hb. Gray., hb. U. S. Nat. Mus.), Masaya, *Baker*, n. 2220 (hb. Gray.).

26. A. LUCIDUM Robinson, fruticosum ramosum 4–5 dm. altum decumbens; caulibus nodosis flexuosis maturitate a cortice grisea tectis; ramis curvato-ascendentibus plerisque in media parte praesertim foliosis; foliis oppositis firmis ovatis acutis basi angustatis acute serratis 1.5–4.5 cm. longis 7–20 mm. latis glabriusculis vel plus minusve scabridis supra laete viridibus lucidis veniis prominulentibus albidis subtus dilutiore viridibus punctatis tenuiter reticulatis; corymbis laxis saepe compositis; capitulis pro genere majusculis 9–10 mm. diametro ca. 80-floris; involucri hemisphaerici squamis anguste lanceolatis attenuatis viridibus 2-costatis crispe puberulis; corollis albis

glandulari-atomiferis; achaeniis maturitate nigris 2 mm. longis glaberrimis; pappo crateriformi albido margine subintegro.— Proc. Am. Acad. xxxvi. 475 (1901).— MEXICO: in civitate Morelos in declivitatibus muscosis Sierrae de Tepoxtlan, alt. 2300 m., *Pringle*, n. 7851 (hb. Gray.), n. 8362 (hb. Gray., hb. J. D. Sm.), n. 9844 (hb. Gray., hb. U. S. Nat. Mus.), n. 13,022 (hb. Gray., hb. U. S. Nat. Mus.). Species precedenti arcte affinis differt habitu paullo lignescentiore, foliis reticulatis lucidis, corollis albis glandulari-granulosis, pappi corona subintegra.

27. A. SALICIFOLIUM Hemsl., perenne herbaceum vel distincte fruticosum laxe et subdichotome ramosum gracili 0.6–1.3 m. altum brevissime hirtellum scabriusculum; ramis virgatis; foliis oppositis (vel supremis alternis) anguste lanceolatis tenuibus vel saepius firmiusculis plus minusve reticulatis planis vel saepius conduplicatis 4–11 cm. longis 0.5–3.6 cm. latis obtuse subremoteque serrato-dentatis vel integriusculis utrinque laete viridibus; corymbis terminalibus saepius compositis et laxiusculis; capitulis, flosculis, achaeniis eis *A. corymbosi* simillimis.— Biol. Cent.-Am. Bot. ii. 83 (1881). *Coelestina corymbosa* Benth. Bot. Sulph. 111 (1844), pro parte, nec DC. *Ageratum strictum* Hemsl. l. c. (1881), ubi per errorem (ex sched. Galeottii introductum) annuum dictum. *Carelia salicifolia* et *C. stricta* (Hemsl.) Ktze. Rev. Gen. i. 325 (1891).— MEXICO: inter San Blas et Tepic, *Sinclair* (hb. Kew., phot. in hb. Gray.); Jalisco, prope Guadalajaram, *Palmer* (anno 1886), n. 289 partim (hb. Gray.), *Pringle*, n. 11,898 (hb. Gray.); Michoacan, ad Uruapam, *Galeotti*, n. 2451 (hb. Kew., phot. in hb. Gray.), ad Vallecito in terris argillaceis, *Langlassé*, n. 310 (hb. Gray.), forma vegetior; Morelos, in collibus supra Cuernavacam, *Pringle*, n. 6234 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.), nn. 9045, 9845 (hb. Gray., hb. U. S. Nat. Mus.).

NOTA.— Species quamquam plerumque facile recognoscenda tamen ab *A. corymboso* foliis longioribus angustioribus saepius viridioribus exceptis vix distinguenda. An potius ei varietas?

Species transferendae vel excludendae vel inquirendae.

A. adscendens Sch. Bip. = OXYLOBUS ADSCENDENS (Sch. Bip.) Robinson & Greenman.

A. Agrianthus O. Hoffm. in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5, 134 (1890). *Agrianthus corymbosus* DC. Prod. vii. 266 (1838). *Ageratum corymbosum* (DC.) Benth. ["in Benth. & Hook. f. Gen. Pl. ii. 242 (1873)"] ex Bak. in Mart. Fl. Bras. vi. pt. 2, 196 (1876), non

Zuccag. Species ad TRICHOGONIAM approximans tamen ultius scrutanda.

A. album Willd. = A. CONYZOIDES, f. ALBUM (Willd.) Robinson.

A. alternifolium (Gardn.) Bak. in Mart. Fl. Bras. vi. pt. 2, 195 (1876). *Campuloclinum alternifolium* Gardn. in Hook. Lond. Jour. Bot. vi. 438 (1847). Species dubia ultius inquirenda.

A. altissimum L. Sp. Pl. ii. 839 (1753) = EUPATORIUM URTICAEFOLIUM Reichard. Vide Robinson, Proc. Am. Acad. xlii. 46 (1906).

A. angustifolium Spreng. Syst. iii. 446 (1826) = CALEA ANGUSTIFOLIA (Spreng.) Sch. Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 3, 256 (1884).

A. aquaticum Roxb. Hort. Beng. 61 (1814) = ADENOSTEMMA LAVENIA (L.) Ktze. Rev. Gen. i. 304 (1891).

A. arbutifolium HBK. = OXYLOBUS ARBUTIFOLIUS (HBK.) Gray.

A. brachystephanum Regel = A. LATIFOLIUM Cav.

A. caeruleum Hort. Reg. Par. ex Lam. Dict. i. 54 (1783). Species dubia seu A. HOUSTONIANUM Mill. seu A. CONYZOIDES L.

A. callosum Wats. = ALOMIA CALLOSA (Wats.) Robinson.

A. campuloclinioides Bak. in Mart. Fl. Bras. vi. pt. 2, 196 (1876). Species ad TRICHOGONIAM approximans ultius scrutanda.

A. ciliare L. Sp. Pl. ii. 839 (1753). Species valde dubia non recognescenda fortasse forma A. CONYZOIDIS.

A. ciliare L., β Lour. Fl. Cochin. ii. 484 (1790). Omnino ignotum.

A. coelestinum Sims. = A. CORYMBOSUM Zuccag.

A. coeruleum Desf. Tab. 98 (1804), nomen.

A. coeruleum Sieber ex Bak. in Mart. Fl. Bras. pt. 2, 345 (1876) = EUPATORIUM MACROPHYLLUM L.

A. confertum (Gardn.) Benth. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 195 (1876). *Decachaeta conferta* Gardn. in Hook. Lond. Jour. Bot. v. 463 (1846). *Carelia conferta* (Gardn.) Ktze. Rev. Gen. i. 325 (1891). Species ob pappo setiformi ex *Agerato* excludenda ultius scrutanda.

A. conspicuum Hort. ex C. Koch & Fint. Wochenschr. i. 33 (1858) = (ut dicitur) EUPATORIUM GLECHONOPHYLLUM Less.

A. conyzoides Sieber ex Steud. Nom. ed. 2, i. 37 (1841) = (f. Steud. l. c.) *Eupatorium repandum* Willd. i. e. E. CORYMBOSUM Aubl.

A. conyzoides α *obtusifolium* (Lam.) DC. l. c. = *A. coeruleum* Hort. Reg. Par. Vide supra.

A. conyzoides β *hirtum* (Lam.) DC. l. c. = A. CONYZOIDES L.

A. conyzoides γ *mexicanum* (Sims) DC. Prod. v. 108 (1836) = A. HOUSTONIANUM Mill.

A. conyzoides δ *cordifolium* (Roxb.) DC. l. c. Var. non certe constata

ex characteribus videtur forma parvi momenti A. CONYZOIDIS L. vel fortasse A. HOUSTONIANI Mill.

A. cordifolium Roxb. Fl. Ind. iii. 415 (1832). Vide supra (*A. conyzoides δ cordifolium* (Roxb.) DC.).

A. corymbosum (DC.) Benth. Vide supra (*A. Agrianthus* O. Hoffm.).

A. corymbosum Zuccag., var. *St. Antonii* Sch. Bip. ex Klatt, Leopoldina, xx. 75 (1884). Nomen.

A. echioides (Less.) Hemsl. = ALOMIA ECHIOIDES (Less.) Robinson.

A. febrifugum Sesse ex DC. Prod. v. 104 (1836) = PIQUERIA TRINERVIA Cav.

A. glanduliferum Sch. Bip. = OXYLOBUS GLANDULIFERUS (Sch. Bip.) Gray.

A. glanduliferum Sch. Bip., var. *albiflorum* Sch. Bip. = OXYLOBUS GLANDULIFERUS (Sch. Bip.) Gray, typicus.

A. guianense Aubl. Guian. ii. 800 (1775) = EUPATORIUM MACROPHYLLUM L.

A. heterolepis Bak. = ALOMIA HETEROLEPIS (Bak.) Robinson.

A. hirsutum Poir. Suppl. i. 242 (1810), sphalm. pro *hirtum* = A. CONYZOIDES L.

A. hirtum Lam. = A. CONYZOIDES L.

A. humile Salisb. Prod. 188 (1796) = A. CONYZOIDES L.

A. intermedium Hemsl. = A. MARITIMUM HBK., var. INTERMEDIUM (Hemsl.) Robinson.

A. isocarphoides (DC.) Hemsl. = ALOMIA ISOCARPHOIDES (DC.) Robinson.

A. Lasseauxii Carr. Rev. Hort. xlii. 90 (1870) cum icone pessima. *Conoclinium Lasseauxii* Carr. in Dur. Ind. Sem. Hort. Burdig. 1872, p. 15 (1872) = EUPATORIUM LASSEAUXII Carr. l. c.

A. latifolium (Benth.) Hemsl. = A. OERSTEDII Robinson et A. RUGOSUM Coult.

A. lineare Cav. Ic. iii. 3, t. 205 (1795) = PALAFOXIA LINEARIS (Cav.) Lag.

A. longifolium (Gardn.) Benth. = ALOMIA LONGIFOLIA (Gardn.) Robinson.

A. maritimum HBK. β Sch. Bip. = A. LATIFOLIUM Cav.

A. matricarioides (Spreng.) Less. Syn. Comp. 155 (1832) = PHANIA MATRICARIOIDES (Spreng.) Griseb.

A. melissaefolium DC. Prod. v. 109 (1836), excl. syn. *Chrysocoma pauciflora* Arrab [Vellozo]. Species ad TRICHOGONIAM valde approximans ultius scrutanda.

A. mexicanum Sims, Bot. Mag. t. 2524 (1825) = A. HOUSTONIANUM Mill.

A. microcarpum (Benth.) Hemsl. = ALOMIA MICROCARPA (Benth.) Robinson.

A. microcephalum Hemsl. = ALOMIA MICROCEPHALA (Hemsl.) Robinson.

A. microphyllum Sch. Bip. in Seemann, Bot. Herald, 298 (1856) = AGERATELLA MICROPHYLLA (Sch. Bip.) Gray.

A. muticum Griseb. = A. LATIFOLIUM Cav.

A. nanum Hort. ex Sch. Bip. in C. Koch & Fint. Wochensch. i. Garten-Nachr. 26 (1858) = (ex Hook. f. & Jacks. Ind. Kew. i. 58) A. SUFFRUTICOSUM Regel.

A. obtusifolium Lam. Dict. i. 54 (1783). Species non constata verisimiliter seu A. CONYZOIDES L. seu A. HOUSTONIANUM Mill.

A. odoratum Vilm. Fl. Pl. Terre, ed. 2, 42 (1866) = A. CONYZOIDES L.

A. paniculatum Hort. ex Steud. Nom. ed. 2, i. 609 (1840) = BRICKELLIA PANICULATA (Mill.) Robinson, Proc. Am. Acad. xlii. 48 (1906).

A. pedatum Ort. Hort. Matr. Dec. 38 (1797) = FLORESTINA PEDATA (Cav.) Cass.

A. Pohlianum Bak. in Mart. Fl. Bras. vi. pt. 2, 197 (1876). Species minime cognita ob pappi paleis setiformibus et involucri squamis pluriseriatim imbricatis certe ex genere expellenda et ultius scrutanda.

A. punctatum Jacq. Hort. Schönb. iii. 28, t. 300 (1798) = STEVIA SERRATA Cav.

A. punctatum Ort. Hort. Matr. Dec. 37 (1797) = STEVIA PUNCTATA (Ort.) Pers.

A. purpureum Aubl. Pl. Guian. ii. 800 (1775) Species nunquam recognita verisimiliter *Eupatorii* species ut *A. guianense* Aubl.

A. purpureum Sesse ex DC. Prod. v. 122 (1836) = STEVIA VISCIDA HBK.

A. quadriflorum Blanco, Fl. Filip. 624 (1837) = ELEPHANTOPUS SPICATUS B. Juss. fide Villarii in Blanco, Fl. Filip. ed. 3, Nov. Append. 114 (1880).

A. rhytidophyllum Robinson = A. PALEACEUM (Gay) Hemsl.

A. rubens Viviani, Elench. Pl. Hort. Dinegro, 9 (1802). Species neglecta et obscura mihi omnino ignota.

A. serratum Glaziou, Bull. Soc. Bot. Fr. lvi, mém. 3d, 382 (1909), nomen subnudum.

A. sessilifolium Schauer, Linnaea, xix. 715 (1847) = TRICHOCORONIS SESSILIFOLIA (Schauer) Robinson, Proc. Am. Acad. xlii. 35 (1906).

A. strictum Hemsl. = A. SALICIFOLIUM Hemsl.

A. strictum Sims, Bot. Mag. t. 2410 (1823) = ADENOSTEMMA LAVENIA (L.) Ktze.

A. viscosum Ort. Dec. 36 (1797) = STEVIA SALICIFOLIA Cav.
A. Wrightii Torr. & Gray ex Gray Proc. Am. Acad. i. 46 (1848) = TRICHOCORONIS WRIGHTII (Torr. & Gray) Gray, Pl. Fendl. 65 (1849).

3. REVISION OF THE GENUS OXYLOBUS.

The claims of *Oxylobus* Moc. to generic rank rest quite as much upon habit and peculiar habitat as upon readily stated technical distinctions, yet they seem adequate. This small group of three well marked and obviously related species differ from all the Ageratums in being high alpine plants with thickish evergreen leaves. If a very doubtful report of one of them from Venezuela is excepted, they are confined to certain of the highest mountains of southern Mexico being found about at the timber line in borders of coniferous woods. The commonest of the three, *O. arbutifolius*, first described by Kunth as an *Ageratum*, was placed in *Phania* by DeCandolle, but is clearly distinct from that genus by the presence of a well developed apical appendage on the anthers. DeCandolle associated with it a second supposed species, his *Phania trinervia*, known to him only from one of Mociño's sketches. This second species has long remained vague, though Hemsley, Biol. Cent.-Am. Bot. ii. (1881), surmised its probable identity with the earlier species of Kunth. To the writer it seems that this identity may now be stated with definiteness. The tracing of Mociño's sketch, reproduced in the Calques des Dessins, shows no difference which may not be readily explained by the crudeness of the draftsmanship. The portion of Mexico in question has in recent years been diligently and effectively explored by several highly trained collectors without the discovery of any second species of just this habit. Finally it may be remarked that the eldest DeCandolle appears to have known the Mexican flora chiefly from the collections of Mociño & Sesse, Lagasca, Mendez, Née, and Haenke and on several occasions redescribed unconsciously the species of Kunth, seeming never to have had adequate opportunities to examine the series of plants collected by Humboldt and Bonpland.

The type of *O. glanduliferus* presents a curious confusion of more technical than practical importance. The species was first distinguished and named, though not described, by Schultz-Bipontinus, who on herbarium sheets noted a typical bluish-flowered form and a white-flowered condition, which he labelled var. *albiflorum* Sch. Bip. It was this white-flowered variety which Hemsley later described as *Ageratum glanduliferum* Sch. Bip. and which accordingly becomes ipso facto the

type of the species. Further collection may show the two forms sufficiently marked to make it worth while to distinguish them by name, in which event it would be the blue-flowered one which would have to be given a new designation thus reversing the treatment of Schultz, the original author, whose manuscript names, though critical have no nomenclatorial status since unaccompanied by published descriptions. However, the distinction seems to be here scarcely of taxonomic moment. The bluish color appears to be in this genus paler and in drying much less permanent than in *Ageratum* or *Alomia* so that in any but very fresh or recent and carefully dried material a sharp distinction would scarcely be possible.

The technical distinctions of *Oxylobus* are chiefly in the form of the corolla, which has a relatively slenderer proper tube than is usual in *Ageratum* and a more ample and abruptly expanded throat. The lobes of the limb are not so uniformly acute as the generic name would suggest, yet they are longer and more widely spreading than in the nearly related genera. The pappus is uniformly short and its scales are so deeply and irregularly cleft that their number, though not large, becomes indefinite.

OXYLOBUS Moc. (Nomen ab ὀξύς, *acutus*, et λοβός, *lobus*, dentes corollae limbi alludens.) Capitula homogama parva vel mediocria. Involucrum subcylindrati- vel infundibuliformi-campanulatum, squamis ovato- vel lanceolato-oblongis acutis dorso glandulari-tomentellis subherbaceis, costis pluribus obscuris vel nullis. Receptaculum planiusculum nudum. Corollae tubus proprius gracilis, faucibus campanulato-cylindratis abrupte ampliatis, limbi dentibus oblongis vel anguste ovatis plerisque acutiusculis patentibus. Antherae apice cum appendice membranacea ovata munitae basi rotundatae. Achaenia graciliter prismatica 5-angularia deorsum leviter decrescentia in angulis sursum scabrata basi callosa. Pappus e squamulis 5–10 inaequalibus plerisque acutis et fimbriatis compositus achaenio multo brevior.— Moc. ex DC. Prod. v. 115 (1836); Gray, Proc. Am. Acad. xv. 25 (1879); Klatt, Leopoldina, xx. 75 (1884); Robinson & Greenman, Proc. Am. Acad. xli. 272 (1905). *Phania* Sect. *Oxylobus* (Moc.) DC. Prod. v. 115 (1836); Endl. Gen. 367 (1838). Ad *Ageratum* allocatus, Benth. & Hook. f. Gen. ii. 242 (1873); Hemsl. Biol. Cent.-Am. Bot. ii. 80 (1881); Hoffm. in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5, 137 (1890). In *Careliam* injectus, Ktze. Rev. Gen. i. 325 (1891). —Suffrutices decumbentes ramosi vel simplices. Folia opposita subcoriacea sempervirentia obtusa crenulata tenuiter reticulato-

venosa impunctata. Capitula in cymis compositis congestim vel laxiuscule disposita.— Species 3, omnes in regione alto-alpina montium austro-menicanorum incolae, una ut dicitur etiam in Venezuela reperta sit.

Clavis specierum.

Capitula ca. 20-flora. Folia elliptica subsessilia parva 1–2 cm. longa
1. *O. arbutifolius.*
Capitula ca. 75-flora. Folia oblonga basi abrupte rotundata, inferioribus bene petiolatis. . . . . 2. *O. glanduliferus.*
Capitula ca 35-flora. Folia spatulata basi attenuata. . . . . 3. *O. adscendens.*

1. O. ARBUTIFOLIUS (HBK.) Gray, decumbens laxe caespitosus; caulibus flexuosis; ramis curvato-ascendentibus foliosissimis 1–6 dm. longis simplicibus vel ramosis teretibus saepius purpurascentibus glanduloso-tomentellis, internodiis inferioribus brevissimis 2–3 supremis longioribus usque ad 2–5 cm. longitudine; foliis ellipticis 8–19 mm. longis 3.5–10 mm. latis crenulato-serratis plus minusve praesertim marginem versus glandulari-puberulis supra viridibus subtus paullo pallidioribus venulosis; cymis 3–12-capitulatis 3–5 cm. diametro, pedicellis ascendentibus rectis filiformibus 6–20 mm. longis; capitulis ca. 20-floris; involucro subcylindrati-campanulato 4 mm. diametro 5 mm. alto, squamis exterioribus lanceolati-oblongis acutis dorso glandulari-tomentellis, interioribus angustioribus; corollis glabris 3.5 mm. longis, tubo proprio 1.6 mm. longo fauces subcylindratas aequanti; achaeniis plerisque arcuatis basin versus decrescentibus angulis sursum scabratis; pappi squamulis oblongis vel linearibus fimbriatis 0.7 mm. longis.— Proc. Am. Acad. xv. 26 (1879). *Ageratum arbutifolium* HBK. Nov. Gen. et Spec. iv. 149 (1820). *Phania arbutifolia* (HBK.) DC. Prod. v. 115 (1836). *P. trinervia* (Moc.) DC. l. c. (1836); A. DC. Calq. des Dess. t. 527 (1874). *Carelia arbutifolia* (HBK.) Ktze. Rev. Gen. i. 325 (1890).— MEXICO: in monte igniv. Nauhcampatepetl, alt. 3100 m., *Humboldt & Bonpland;* in monte Orizaba, *Galeotti*, n. 2159 (hb. Kew.), *Linden*, n. 1121 (hb. Kew.), alt. 3050 m., *Liebmann*, n. 212 (hb. Gray.), alt. 3300–3600 m., *Liebmann*, n. 76 (hb. Gray.); alt. 3965 m., *Seaton*, n. 237 (hb. Gray.); alt. 4020 m., *Nelson*, n. 286 (hb. Gray., hb. J. D. Sm.); in silvis coniferis, alt. 3500 m., *Pringle*, n. 8555 (hb. Gray., hb. J. D. Sm.); in declivitate montis Orizabae, *Rose & Hay*, nn. 5738, 5760 (hb. Gray.), alt. 2750–3800 m., *Liebmann*, n. 213 f. Hemsl. l. c., in saxis prope marginem superiorem silvarum, Ixtaccihuatl, alt. 3300–3600 m., *Purpus*, n. 187 (hb. Gray.), in saxis supra silvas, *Purpus*, n. 1567 (hb. Gray.), in saxis humidis, Citlaltepetl, alt. 3050–3350 m., *Purpus*, n.

2767 (hb. Gray.); in rupibus frigidulis Sierrae de las Cruces, *Pringle*, n. 4290 (hb. Gray.); in monte igniv. Popocatepetl in regione pinorum, *Galeotti*, n. 2380 (hb. Kew.).

2. O. GLANDULIFERUS (Sch. Bip.) Gray, suffrutex ramosus 1–1.3 m. altus sordide glanduloso-tomentosus; ramis ascendentibus foliosis, internodiis superioribus 3–5 cm. longis inferioribus vix 1 cm. longis; foliis inferioribus oblongis obtusis basi subtruncatis vel abrupte rotundatis crenatis utrinque viridibus pilosellis margine glandulari-tomentellis 2–3 cm. longis 1–1.8 cm. latis ad 7 mm. longe petiolatis, foliis superioribus basi subcuneato-angustatis subsessilibus; cymis compositis trichotomis paucicapitulatis; capitulis majusculis ca. 75-floris; involucri plus minusve 5-angulati 6 mm. diametro et alti squamis exterioribus ovato-oblongis acuminatis glanduloso-puberulis ca. 7 mm. longis; interioribus oblanceolato-linearibus; corollis 5.6 mm. longis, tubo proprio ca. 2 mm. longo ad junctionem faucium pilosulo, faucibus infundibuliformibus ca. 2 mm. altis, dentibus limbi 1.6 mm. longis oblongis acutiusculis; achaeniis gracilibus 3–3.5 mm. longis; pappi squamulis 5 vel pluribus oblongis 0.7 mm. longis margine laceratis basi plus minusve connatis.— Proc. Am. Acad. xv. 26 (1879), sine char.; Klatt, Leopoldina, xx. 75 (1884). *Ageratum glanduliferum* Sch. Bip. ex Hemsl. Biol. Cent.-Am. Bot. ii. 82 (1881), ubi descriptum. *A. glanduliferum*, var. *albiflorum* Sch. Bip. ex Gray, l. c. *Oxylobus glanduliferus*, var. *albiflorus* (Sch. Bip.) Klatt, l. c. *Carelia glandulifera* (Sch. Bip.) Ktze. Rev. Gen. i. 325 (1891). — MEXICO: Sempoaltepec, *Liebmann*, n. 238 (hb. Gray.), specimen typicum, i. e. specimen a quo descriptio principalis a cl. Hemsleyo derivata est (= etiam var. *albiflorum* Sch. Bip.); Oaxaca, prope Sierram de San Felipe, alt. 2900–3350 m., *Nelson*, n. 1112 (hb. Gray.), in summis rupibus, Sierra de San Felipe, alt. 3175 m., *Pringle*, n. 4833 (hb. Gray., hb. J. D. Sm.); sine loco indicato, *Linden*, n. 1155 f. Klatt.

Nota.—Specimen in hb. Kew. ex "Venezuela &c., *Funcke & Schlim*, n. 1155" videtur fortasse lapsu pennae vel transpositione schedularum pro *Linden*, n. 1155, specimen verum hujus species ut videtur ex regione normali mexicana. Idem est sine dubitatione id quod cl. Hemsleyius, l. c. 82, "*Fendler*, n. 1155" per errorem scripsit. Species ergo in Venezuela adhuc non certe demonstrata.

3. O. ADSCENDENS (Sch. Bip.) Robinson & Greenman, perennis decumbens subherbaceus 2.5–5 dm. altus basi prostratus radicans foliosus; caule tereti curvato-ascendenti, internodiis erectis 3–4 longis usque ad 1–2 dm. longitudine glanduloso-puberulis; foliis imis spatulatis 3–4 cm. longis 1–2 cm. latis crenulatis basi in petiolum ad 1.5 cm. longum cuneatim attenuatis supra laete viridibus subtus pallide

viridibus venulosis glabriusculis; foliis caulinis oppositis remotis oblanceolato-oblongis sessibilus margine glanduloso-puberulis; cymis terminalibus compositis densis ca. 4 cm. diametro; capitulis ca. 35-floris; involucri 5–6 diametro aeque alti squamis exterioribus anguste oblongis acutis dorso sordide glanduloso-tomentosis interioribus linearibus; corollis 3–7 mm. longis glabris, tubo proprio 1.5 mm. longo fauces campanulatas aequanti; achaeniis 2.8 mm. longis deorsum leviter decrescentibus in angulis sursum scabratis; pappi squamulis pluribus angustis fimbriatis 0.5 mm. longis.— Proc. Am. Acad. xli. 272 (1905). *Ageratum adscendens* Sch. Bip. ex Benth. & Hook. f. Gen. ii. 242 (1873), nomen; Hemsl. Biol. Cent.-Am. Bot. ii. 80 (1881), ubi descriptum; Klatt, Leopoldina, xx. 75 (1884). *Carelia adscendens* (Sch. Bip.) Ktze. Rev. Gen. i. 325 (1891).— MEXICO: in monte Orizaba ad Vaqueriam de Jacal, alt. 3050-3660 m., *Liebmann*, n. 214 (hb. Kew., hb. Gray.); alt. 3660 m., *Linden*, n. 489 (hb. Kew.); Puebla, in monte igniv. Ixtaccihuatl in graminosis prope marginem superiorem silvarum, *Purpus*, n. 1497 (hb. Gray., hb. U. S. Nat. Mus.); in civitate Mexico, in pascuis altis Deserto Viejo, *Bourgeau*, n. 839 (hb. Kew., hb. Gray.), in Serrania de Ajusco in declivitatibus patentibus, alt. 2300 m., *Pringle*, n. 6612 (hb. Gray., hb. U. S. Nat. Mus., hb. J. D. Sm.); Hidalgo, in graminosis humidis Sierrae de Pachuca, alt. 3050., *Pringle*, n. 9841 (hb Gray., hb. U. S. Nat. Mus.); Verz Cruz, in Cordillera, *Galeotti*, n. 2160 (hb. Kew.); sine loco indicato, *Ehrenberg*, n. 463a (hb. U. S. Nat. Mus.).

INDEX EXSICCATARUM.

Ag. = Ageratum. Al. = Alomia. Ox. = Oxylobus.

ABBOTT, *Ag. conyzoides* L.
ALVAREZ, 751 = *Ag. albidum* (DC.) Hemsl.
ANDERSSON, *Ag. latifolium* Cav., v. *galapageium* Robinson.
ANDRIEUX, 287 = *Ag. paleaceum* (Gay) Hemsl.; 543 = *Ag. albidum* (DC.) Hemsl.
BAKER, 2021 = *Ag. conyzoides* L.; 2220 = *Ag. scabriusculum* (Benth.) Hemsl.
BALL, *Ag. conyzoides* L.
BANG, 407 partim = *Ag. conyzoides* L., partim = *Ag. conyzoides* L., v. *inaequipaleaceum* Hieron.
BAUR, *Ag. latifolium* Cav., v. *galapageium* Robinson.
BENNETT, *Ag. littorale* Gray.
BERTERO, *Ag. domingense* Spreng.
BEYRICH, *Ag. conyzoides* L., *Ag. fastigiata* (Gardn.) Benth.
BILIMEK, 488, 579 = *Al. alata* Hemsl.
BINOT, 15 = *Ag. conyzoides* L.
BLANCHET, 2754 = *Al. foliosa* (Gardn.) Benth. & Hook. f.; 3123 = *Al. heterolepis* (Bak.) Robinson; 3700 = *Ag. micropappum* Bak.
BLODGET, *Ag. littorale* Gray.
BOTTERI, 623 = *Al. echioides* (Less.) Robinson.
BOTTERI & SUMICRAST, 524 = *Al. isocarphoides* (DC.) Robinson.
BOURGEAU, 719 = *Ag. corymbosum* Zuccag.; 839 = *Ox. adscendens* (Sch. Bip.) Robinson & Greenman; 1216 = *Al. alata* Hemsl.; 1557 =

Ag. Houstonianum Mill.; 2393, 3207 = *Al. echioides* (Less.) Robinson.

BRANDEGEE, *Ag. corymbosum* Zuccag.

BRENES, 14, 491 = *Ag. Oerstedii* Robinson.

BRITTON, E. G., 6375 = *Ag. conyzoides* L., v. *inaequipaleaceum* Hieron.; sine num. *Ag. latifolium* Cav.

BRITTON & COWELL, 927 = *Ag. conyzoides* L.

BRITTON & MILLSPAUGH, 2240 = Ag. *latifolium* Cav.

BROADWAY, *Ag. conyzoides* L.

BROWN & BROWN, 31a, 51 = *Ag. conyzoides* L.; 254 = *Ag. Houstonianum* Mill.

BRUNET, 24 = *Al. fastigiata* (Gardn.) Benth.

BUCHANAN, 740 = *Ag. conyzoides* L.

BUCHTIEN, 1456 = *Ag. conyzoides* L.

BURCHELL, 854 = *Ag. conyzoides* L.

CHAPMAN, 49 = *Ag. littorale* Gray.

CHATTERJEE, *Ag. Houstonianum* Mill.

CLAUSSEN, *Al. foliosa* (Gardn.) Benth. & Hook. f.

CLUTE, 190 = *Ag. Houstonianum* Mill.

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CONZATTI & GONZÁLEZ, 542 = *Ag. albidum* (DC.) Hemsl.

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CURTISS, 77 = *Ag. conyzoides* L., v. *inaequipaleaceum* Hieron.; 650 = *Ag. maritimum* HBK.; 1163, 5446 = *Ag. littorale* Gray.

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DRILL, *Ag. conyzoides* L.

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DUSS, 934, 2520, 4681 partim = *Ag. conyzoides* L.; 4681 partim = *Ag. Houstonianum* Mill.

EGGERS, 303 = *Ag. conyzoides* L.; 3445 = *Ag. Houstonianum* Mill.

EHRENBERG, 463a = *Ox. adscendens* (Sch. Bip.) Robinson & Greenman.

ERVENDBERG, 100 = *Ag. Houstonianum* Mill.

EVERETT, 16 = *Ag. conyzoides* L.

FENDLER, 652 = *Ag. conyzoides* L.

FRIEDRICHSTHAL, *Ag. scabriusculum* (Benth.) Hemsl.

FUERTES, 458 = *Ag. latifolium* Cav.

GALEOTTI, 2098 = *Al. microcephala* (Hemsl.) Robinson; 2159 = *Ox. arbutifolius* (HBK.) Gray; 2160 = *Ox. adscendens* (Sch. Bip.) Robinson & Greenman; 2200 = *Al. echioides* (Less.) Robinson; 2202 = *Ag. tomentosum* (Benth.) Hemsl.; 2380 = *Ox. arbutifolius* (HBK.) Gray; 2451 = *Ag. salicifolium* Hemsl.

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GHIESBREGHT, 111, 547 = *Ag. tomentosum* (Benth.) Hemsl.

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GUILLEMIN-TARAYRE, *Ag. corymbosum* Zuccag.

HAENKE, *Al. isocarphoides* (DC.) Robinson.

HAHN, 1190 = *Ag. conyzoides* L.

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HENRY, 9094 = *Ag. conyzoides* L.
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HEYDE & LUX (distrib. J. D. Sm.), 3781 = *Ag. conyzoides* L.; 4228 = *Ag. elachycarpum* Robinson; 4243 = *Ag. rugosum* Coult.; 6153 = *Al. guatemalensis* Robinson.
HILDEBRANDT, 3304a, 3500 = *Ag. conyzoides* L.
HOLST, 8860 = *Ag. conyzoides* L.
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HUMBOLDT & BONPLAND, 1273 = *Ag. maritimum* HBK.; 3949 = *Al. ageratoides* HBK.; sine num. *Ag. corymbosum* Zuccag., v. *latifolium* (DC.) Robinson, *Ox. arbutifolius* (HBK.) Gray.
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JENMAN, 5398 = *Ag. conyzoides* L.
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NICHOLS, 33 = *Ag. Houstonianum* Mill.
OERSTED, 241, 247, 248 = *Al. microcarpa* (Benth.) Robinson; 251 = *Ag. Oerstedii* Robinson; sine num. = partim *Ag. scabriusculum* (Benth.) Hemsl., partim *Ag. tomentosum* (Benth.) Hemsl.
PALMER (anno 1874) 192 = *Ag. littorale* Gray; (anno 1880) 427 partim = *Ag. corymbosum* Zuccag., v. *europhyllum* Robinson; 427 partim, 428 = *Ag. corymbosum* Zuccag.; (anno 1885) 31 = *Ag. corymbosum* Zuccag., f. *album* Robinson; 110 = *Ag. corymbosum* Zuccag., v. *longipetiolatum* Robinson; (anno 1886) 289 = partim *Ag. corymbosum* Zuccag., partim *Ag. salicifolium* Hemsl.; 290, 351 = *Ag. corymbosum* Zuccag., v. *jaliscense* Robinson, f. *lactiflorum* Robinson; 437 partim = *Ag. platypodum* Robinson; 715 = *Ag. corymbosum* Zuccag., v. *jaliscense* Robinson; (anno 1891) 1587 = *Ag. corymbosum*, v. *latifolium* (DC.) Robinson; (anno 1892) 1834 = *Ag. latifolium* Cav.; 1850, 1890 = *Ag. conyzoides* L.; 2066 = *Ag. Houstonianum* Mill.; (anno 1896) 506 = *Ag. corymbosum* Zuccag.;

(anno 1898) 307 = *Ag. corymbosum* Zuccag.; (anno 1902) 101 = *Ag. corymbosum* Zuccag., v. *euryphyllum* Robinson; 382 = *Ag. corymbosum* Zuccag., v. *subsetiferum* Robinson; (anno 1904) 154½, 387 = *Ag. corymbosum* Zuccag.; (anno 1906) 486 = *Ag. corymbosum* Zuccag.

PALMER & RILEY, 65 = *Ag. Houstonianum* Mill.; 712, 739 = *Ag. maritimum* HBK.; 1068 = *Ag. conyzoides* L.

PARRY & PALMER, 315 = *Ag. corymbosum* Zuccag., v. *euryphyllum* Robinson; 317 = *Ag. corymbosum* Zuccag.; 318 = *Ag. corymbosum* Zuccag., v. *euryphyllum* Robinson.

PECK, 80 = *Ag. Peckii* Robinson; 99 = *Ag. radicans* Robinson.

PITTIER, 1891 = *Ag. conyzoides* L.; 2390, 3415, 3533, 4139 = *Al. microcarpa* (Benth.) Robinson; 4914 = *Ag. riparium* Robinson; 6995 = *Ag. Houstonianum* Mill.

POHL, 358 = *Al. Pohlii* (Sch. Bip.) Bak.; 371, 535 = *Al. fastigiata* (Gardn.) Benth.; 669 = *Al. foliosa* (Gardn.) Benth & Hook. f.

POLLARD, COLLINS & MORRIS, 12 = *Ag. littorale* Gray.

PRINGLE, 669 = partim *Ag. corymbosum* Zuccag., partim *Ag. corymbosum* Zuccag., f. *album* Robinson; 2166 = *Al. callosa* (Wats.) Robinson; 3599 = *Ag. corymbosum* Zuccag., v. *latifolium* (DC.) Robinson; 4290 = *Ox. arbutifolius* (HBK.) Gray; 4739 = *Al. callosa* (Wats.) Robinson; 4816 = *Ag. albidum* (DC.) Hemsl.; 4833 = *Ox. glanduliferus* (Sch. Bip.) Gray; 5675 = *Ag. paleaceum* (Gay) Hemsl.; 5786 = *Ag. tomentosum* (Benth.) Hemsl.; 6177 = *Ag. paleaceum* (Gay) Hemsl.; 6229 = *Al. alata* Hemsl.; 6234 = *Ag. salicifolium* Hemsl.; 6267 = *Ag. tomentosum* (Benth.) Hemsl.; 6612 = *Ox. adscendens* (Sch. Bip.) Robinson & Greenman; 6754 = *Ag. tomentosum* (Benth.) Hemsl.; 7851 = *Ag. lucidum* Robinson; 8065 = *Ag. Houstonianum* Mill.; 8362 = *Ag. lucidum* Robinson; 8555 = *Ox. arbutifolius* (HBK.) Gray; 9045 = *Ag. salicifolium* Hemsl.; 9047 = *Ag. corymbosum* Zuccag.; 9353 = *Al. callosa* (Wats.) Robinson; 9522 = *Ag. tomentosum* (Benth.) Hemsl.; 9542 = *Ag. corymbosum* Zuccag., f. *album* Robinson; 9841 = *Ox. adscendens* (Sch. Bip.) Robinson & Greenman; 9842 = *Ag. corymbosum* Zuccag., v. *latifolium* (DC.) Robinson, f. *albiflorum* Robinson; 9843 = *Ag. corymbosum* Zuccag., v. *latifolium* (DC.) Robinson; 9844 = *Ag. lucidum* Robinson; 9845 = *Ag. salicifolium* Hemsl.; 9846 = *Al. alata* Hemsl.; 11,819 = *Al. Wendlandii* (Sch. Bip.) Robinson; 11,898 = *Ag. salicifolium* Hemsl.; 13,022 = *Ag. lucidum* Robinson.

PURPUS, 187 = *Ox. arbutifolius* (HBK.) Gray; 1179 = *Ag. tomentosum* (Benth.) Hemsl.; 1497 = *Ox. adscendens* (Sch. Bip.) Robinson & Greenman; 1565 = *Ag. corymbosum* Zuccag.; 1567 = *Ox. arbutifolius* (HBK.) Gray; 1870 = *Ag. tomentosum* (Benth.) Hemsl.; 2199 = *Al. echioides* (Less.) Robinson; 2547 = *Ag. tomentosum* (Benth.) Hemsl.; 2767 = *Ox. arbutifolius* (HBK.) Gray; 4561 = *Ag. corymbosum* Zuccag.; 4814 = *Ag. tomentosum* (Benth.) Hemsl.

RAMOS, 2086 = *Ag. conyzoides* L.

REGNELL, III 675 = *Ag. conyzoides* L.

REMY, 229 = *Ag. conyzoides* L.

RENSON, 190 = *Ag. conyzoides* L.

RICKSECKER, 250 b, 430 = *Ag. conyzoides* L.

RIEDEL, 711, 959 = *Al. fastigiata* (Gardn.) Benth., 1346 = *Ag. conyzoides* L.

ROSE, 2538 = *Ag. corymbosum* Zuccag., f. *album* Robinson; 2585 = *Ag. corymbosum* Zuccag., v. *jalicense* Robinson, f. *lactiflorum* Robinson; 2739 = *Ag. corymbosum* Zuccag., v. *euryphyllum* Robinson.

ROSE & HAY, 5738, 5760 = *Ox. arbutifolius* (HBK.) Gray.

ROSE, PAINTER & ROSE, 9631 = *Ag. corymbosum* Zuccag.

RUDIO, *Ag. conyzoides* L.; *Ag. Houstonianum* Mill.

RUSBY, 1642, 1643 = *Ag. conyzoides* L.

SALLÉ, *Al. echioides* (Less.) Robinson.

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SCHAFFNER, 202, 293 = *Ag. corymbosum* Zuccag.
SCHIEDE, 304 = *Al. echioides* (Less.) Robinson; sine num. *Ag. Houstonianum* Mill.
SCHOMBURGK, RICH., 488 = *Ag. scorpioideum* Bak.
SCHOMBURGK, ROB., 353 = *Ag. scorpioideum* Bak.
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SEATON, 55 = *Ag. Houstonianum* Mill.; 237 = *Ox. arbutifolius* (HBK.) Gray; 346, 358 = *Ag. tomentosum* (Benth.) Hemsl.
SEEMANN, 267 = *Ag. conyzoides* L.
SELLO, 119 = *Al. myriadenia* (Sch. Bip.) Bak.; 120, 122 = *Al. fastigiata* (Gardn.) Benth.
SHAFER, 207 = *Ag. conyzoides* L.; 1099 = partim *Ag. maritimum* HBK., partim *Ag. maritimum*, f. *calvum* Robinson.
SHANNON (distrib. J. D. Sm.), 600 = *Ag. conyzoides* L.
SHUFELDT, 101 = *Ag. conyzoides* L.
SIMPSON, 246 = *Ag. littorale* Gray.
SINCLAIR, *Ag. petiolatum* (Hook. & Arn.) Hemsl.; *Ag. salicifolium* Hemsl.; *Ag. scabriusculum* (Benth.) Hemsl.
SINTENIS, 59, 3661, 5816 = *Ag. conyzoides* L.; 5874 = *Ag. conyzoides* L., f. *album* (Willd.) Robinson.
SMITH, C. L., 145 = *Ag. Houstonianum* Mill.; 365 = *Ag. albidum* (DC.) Hemsl.; 594 = *Ag. paleaceum* (Gay) Hemsl. 979 = *Ag. Houstonianum* Mill.
SMITH, H. H., 523 = *Ag. conyzoides* L.
SMITH, H. H. & G. W., 543 = *Ag. conyzoides* L.
SMITH, L. C., 277 = *Ag. paleaceum* (Gay) Hemsl.; 285 = *Ag. tomentosum* (Benth.) Hemsl.; 424 = *Ag. albidum* (DC.) Hemsl.
SNODGRASS & HELLER, 423 = *Ag. latifolium* Cav., v. *galapageium* Robinson.
STUHLMANN, *Ag. conyzoides* L.
TAYLOR, 191 = *Ag. conyzoides* L., v. *inaequipaleaceum* Hieron.
THIEME (distrib. J. D. Sm.), 5323 = partim *Ag. conyzoides* L.
THOMAS, *Al. echioides* (Less.) Robinson.
TONDUZ, 4139 = *Ag. latifolium* Cav.; 7281, 8479, 10,816 = *Al. microcarpa* (Benth.) Robinson.
TRIANA, 1157 = *Ag. latifolium* Cav.
TUERCKHEIM, H. VON (distrib. J. D. Sm.), 488 = *Ag. conyzoides* L.; II 999 = *Ag. conyzoides* L.; II 2051 = *Ag. rugosum* Coult.
TWEEDY, 312 = *Ag. littorale* Gray.
ULE, 3904 = *Al. fastigiata* (Gardn.) Benth.
UNDERWOOD & GRIGGS, 871, 872 = *Ag. conyzoides* L.
VALDEZ, 13 = *Ag. Gaumeri* Robinson.
VELASCO, 8967 = *Ag. rugosum* Coult?
WAGENER, *Ag. latifolium* Cav.
WARD, *Ag. corymbosum* Zuccag.
WARMING, 402 = *Al. myriadenia* (Sch. Bip.) Bak.; sine num. partim *Al. angustata* (Gardn.) Benth., partim *Al. Pohlii* (Sch. Bip.) Bak.
WATT, 10,431 = *Ag. conyzoides* L.
WHYTE, 252 = *Ag. polyphyllum* Bak.
WIGHT, 26 = *Ag. latifolium* Cav.
WILKES, *Ag. conyzoides* L.; *Ag. conyzoides* L., v. *inaequipaleaceum* Hieron.
WILLIAMS, *Ag. conyzoides* L.
WISLIZENUS, 181 = *Ag. corymbosum* Zuccag.
WRIGHT, 1129 = *Ag. corymbosum* Zuccag.; 1310 = *Ag. conyzoides* L.; 1631 (anno 1859–1860) = *Ag. latifolium* Cav.; 1631 (annis 1860–1864) = *Ag. maritimum* HBK.; 2798 = *Ag. domingense* Spreng.; sine num. *Ag. conyzoides* L., *Ag. domingense* Spreng., *Ag. scabriusculum* (Benth.) Hemsl.
WRIGHT, PARRY & BRUMMEL, 250 = *Ag. conyzoides* L., v. *inaequipaleaceum* Hieron.
ZIMMERMANN, 70 = *Ag. conyzoides* L.
ZOLLINGER, 23 = *Ag. conyzoides* L.

III. SOME NEW COMBINATIONS REQUIRED BY THE INTERNATIONAL RULES.

By C. A. Weatherby.

While employed at the Gray Herbarium during the summer of 1911 I was engaged in determinative work and in the re-arrangement and incidental revision of certain groups, notably the *Nyctaginaceae*. In the course of these activities it was found impossible to name certain species in accordance with the provisions of the International Rules of Botanical Nomenclature without employing new combinations. I have been requested to put these names on published record and they may be stated as follows:

Nyctaginaceae.

Oxybaphus ciliatifolius, n. nom. *Oxybaphus aggregatus* Torr. Bot. Mex. Bound. 168 (1859), not Vahl, Enum. ii. 41 (1805). *Allionia ciliata* Standley, Contr. U. S. Nat. Herb. xii. 345 (1909), not *Oxybaphus ciliatus* Phil. ex Meigen in Engl. Bot. Jahrb. xvii. 231 (1893).

Oxybaphus comatus (Small), n. comb. *Oxybaphus nyctagineus*, var. *pilosus* Gray in Torr. Bot. Mex. Bound. 174 (1859). *Allionia comata* Small, Fl. Southeast. U. S. 407 (1903).

Oxybaphus Brandegei (Standley), n. comb. *Allionia Brandegei* Standley, Contr. U. S. Nat. Herb. xii. 346 (1909).

Oxybaphus rotatus (Standley), n. comb. *Allionia rotata* Standley, Contr. U. S. Nat. Herb. xii. 347 (1909).

Oxybaphus giganteus (Standley), n. comb. *Allionia gigantea* Standley, Contr. U. S. Nat. Herb. xii. 348 (1909)

Oxybaphus pratensis (Standley), n. comb. *Allionia pratensis* Standley, Contr. U. S. Nat. Herb. xii. 351 (1909).

Oxybaphus Carletoni (Standley), n. comb. *Allionia Carletoni* Standley, Contr. U. S. Nat. Herb. xii. 355 (1909).

Oxybaphus exaltatus (Standley), n. comb. *Allionia exaltata* Standley, Contr. U. S. Nat. Herb. xii. 355 (1909).

Oxybaphus cardiophyllus (Standley), n. comb. *Oxybaphus Cervantesii* of authors, in part, not Sweet, Brit. Fl. Gard. ser. 1, t. 84. (1823). *Allionia cardiophylla* Standley, Contr. U. S. Nat. Herb. xiii. 405 (1911).

IV. ON THE GRAMINEAE COLLECTED BY PROF. MORTON E. PECK IN BRITISH HONDURAS, 1905–07.

By F. Tracy Hubbard.

Prof. Peck's collection of grasses from British Honduras includes four new species and a number of plants that are little known, several of them not previously reported from Central America. The grasses indicate that the flora of British Honduras is composed of some North Mexican, but chiefly of West Indian and South American elements; a fact which Prof. Robinson tells me is true of the other families.

A list of the species collected is as follows —

Tripsacum dactyloides L. Sp. Pl. ed. 2, **2**: 1378 (1763).— Pine ridge, Ycacos Lagoon, March 8, 1907, *M. E. Peck*, no. 703.

Manisuris granularis (L.) Sw. Prodr. Veg. Ind. Occ. 25 (1788).— Open ground, Toledo, February 7, 1907, *M. E. Peck*, no. 653.

Ischaemum latifolium Kunth, Rev. Gram. **1**: 371, t. 99 (1830).— Swampy ground near Manatee Lagoon, December 30, 1905, *M. E. Peck*, no. 254.

Trachypogon plumosus (Humb. & Bonpl.) Nees, Agrost. Bras. 344 (1829).— Pine ridge near Manatee Lagoon, September 8, 1905, *M. E. Peck*, no. 139.

Andropogon condensatus HBK. Nov. Gen. et Spec. **1** : 188 (1816). — Pine ridge near Manatee Lagoon, June 21, 1905, *M. E. Peck*, no. 59.

Andropogon domingensis (Spreng.), comb. nov. *A. hirtiflorus* Kunth, Rev. Gram. **2** : 569, t. 198 (1832). *Streptachne domingensis* Spreng. ex Schultes, Mant. **2** : 188 (1824). *Schizachyrium domingense* (Spreng.) Nash in No. Am. Fl. **17** : 103 (1912). — Pine ridge near Manatee Lagoon, January 8, 1906, *M. E. Peck*, no. 282. There are three older uses of the combination *A. domingensis* viz. Steud. Nom. ed. 1, 45 (1821); Spreng. ex Steud. Nom. ed. 2, **1**: 91 (1841) in syn; and Fourn. Mex. Pl. **2**: 61 (1886). The second use being in synonymy is invalid and as the first and third uses are both based on *Anatherum domingense* R. & S. Syst. Veg. **2**: 809 (1817) which is given as a synonym of *Andropogon leucostachyus* HBK. (1816) [teste specim.] cf. Kunth, Rev. Gram. **1**: 164 (1824) and generally so considered,—they do not interfere with the present combination.

Andropogon leucostachyus HBK. Nov. Gen. et Spec. **1**: 187 (1816).— Pine ridge near Manatee Lagoon, August 10, 1905, *M. E. Peck*, no. 116.

ANDROPOGON SPATHIFLORUS (Nees) Kunth, Enum. Pl. **1**: 496 (1833).— Low pine ridge near Manatee Lagoon, June 21, 1905, *M. E. Peck*, no. 54.

ANDROPOGON VIRGINICUS L. Sp. Pl. **2**: 1046 (1753).— Pine ridge near Manatee Lagoon, September 27, 1905, *M. E. Peck*, no. 150.

ARUNDINELLA DEPPEANA Nees ex Steud. Syn. Pl. Gram. 115 (1854). — Thicket near Manatee Lagoon, February 28, 1906, *M. E. Peck*, no. 359; river bank, Moho R., March 16, 1907, *M. E. Peck*, no. 735. This species may not be distinct from *A. peruviana* (Presl) Steud. l. c. as affirmed by Nash in No. Am. Fl. **17**: 143 (1912), but from the material in the Gray Herbarium it seems to be distinct.

LEPTOCORYPHIUM LANATUM (HBK.) Nees, Agrost. Bras. 84 (1829). — Pine ridge near Manatee Lagoon, August 30, 1905, *M. E. Peck*, no. 137.

DIGITARIA SETIGERA Roth ex R. & S. Syst. Veg. **2**: 474 (1817). *D. setosa* Desv. ex Hamilt. Prodr. Pl. Ind. Occ. 6 (1825). *Syntherisma digitatum* (Sw.) Hitchc. Contr. U. S. Nat. Herb. **12**: 142 (1908) based on *Milium digitatum* Sw. Prodr. Veg. Ind. Occ. 24 (1788) not *D. digitata* Buese in Miq. Pl. Jungh. 381 (1855).— Cultivated ground near Manatee Lagoon, June 18, 1905, *M. E. Peck*, no. 44.

THRASYA CAMPYLOSTACHYA (Hack.) Chase in Proc. Biol. Soc. Wash. **24**: 115 (1911). *Panicum campylostachyum* Hack. in Oesterr. Bot. Zeitschr. **51**: 367 (1901).— Pine ridge near Manatee Lagoon, June 18, 1905, *M. E. Peck*, no. 70. This interesting species originally described from Costa Rica seems to be limited in its distribution to the southern portion of Central America. The determination was kindly verified by Mrs. Chase, Assistant Agrostologist of the Bureau of Plant Industry.

Mesosetum filifolium, sp. nov. Culmi caespitosi, basin versus a vaginis multis arcte imbricatis obtecti, erecti, tenues, 35–70 cm. altitudine, inflorescentiam versus puberuli aliter nodis breviter hispidobarbatis exceptis glabri. Vaginae radicales squamiformes, tumidiusculae, hispidae, abrupte ad folii junctionem contractae babulataeque; eae culmarum elongatae sed internodio breviores, glabrae, in laminas gradatim transeuntes. Ligula barbulata, circa 0.5 mm. longa. Folia erecta, setaceo-filiformis, basin versus conduplicata, 7–28 cm. longa, 0.5 mm. lata, glabra, ea culmarum reducta, supremum saepe vix 1 cm. longum. Inflorescentia erecta, 4–7 cm. longa, 5 mm. diametro; axis flexuosus fere capillaris, excavationi non ostendentius, puberulus vel scaber; pedicellum breve, hispidum. Spiculae patenti-erectae, lineari-oblongae, apicem versus tenebrae, albido-villosae, 5 mm. longae, 1.5 mm. latae; gluma prima quam secunda brevior vel eam subaequans,

3-nervata, acuta, dense hirsuta villis adpressis apicem glumae superantibus, ad basin penicillatum collectis; gluma secunda 5-nervata, involuto-acuminata, quam lemma sterile paullum longior, hirsuta villosa; lemma sterile dorso-concavum, 2-carinatum, 5-nervatum, abrupte acuminatum, carinis apicem versus longe villoso-penicillatis; lemma fertile 5-nervatum, ad apicem carinatum, apice hispidulo et acuto, quam palea 2-nervata paullum longius.— Type (in the Gray Herb.) and only specimen seen, pine ridge near Manatee Lagoon, August 30, 1905, *M. E. Peck*, no. 136. This species is closely allied to *M. exaratum* (Trin.) Chase, but is taller, much longer leaved, the inflorescence longer and the spikelets are larger, more villous and with more pointed parts.

Axonopus laxiflorus (Trin.) Chase in Proc. Biol. Soc. Wash. **24**: 133 (1911). *Anastrophus laxiflorus* (Trin.) Nash in No. Am. Fl. **17**: 163 (1912).— Pine ridge near Manatee Lagoon, July 8, 1906, *M. E. Peck*, no. 464. I have not been able to compare this, but ex char. I believe it to be the above.

Paspalum caespitosum Flügge, Gram. Monogr. 161 (1810).— Open ground, Toledo, March 26, 1907, *M. E. Peck*, no. 769. Not previously reported from Central America, former distribution southern Florida, Bahamas, Jamaica, Cuba, Porto Rico and South America.

Paspalum orbiculatum Poir. in Lam. Encycl **5**: 32 (1804). *P. pusillum* Vent. ex Flügge, Gram. Monogr. 100 (1810).— Open ground, Toledo, October 1, 1906, *M. E. Peck*, no. 541.

Paspalum paniculatum L. Syst. Nat. ed. 10, **2**: 855 (1759).— Open ground, Toledo, October 1, 1906, *M. E. Peck*, no. 542; clearing near Manatee Lagoon, February 27, 1906, *M. E. Peck*, no. 970. A very variable species, the Peck specimens show extremes of pilosity.

Paspalum Peckii, sp. nov., perenne, dense caespitosum, 80 cm. altitudine, radicibus fibrosis. Culmi erecti, crassi, glabri, nodis fuscis paullum breviter pilosis. Vaginae infimae saepe squamiformes, adpresse breviter pilosae; superiores imbricatae, supra aliquid conduplicatae, internodia aequantes vel ea superantes, glabrae sed per majorem vel minorem partem longitudinis suae cum marginibus papilloso-pilosis et ad folii junctionem cum annulo piloso. Ligula membranacea, 2 mm. longa. Folia erecta, rigidiuscula, linearia, plana vel conduplicata, longe acuminata, 10–34 cm. longa, 5–10 mm. lata, marginibus scabris; lamina subtus glabra vel sparse pilosa, supra breve pilosa basin versus densius induta, longe villosa ad basin penicillata. Inflorescentia terminalis, subdigitata, 10–15 cm. longa, in pedunculis rigidis, canaliculatis, glabris vel sparse hispidis longe

exserta; racemi 2–3, saepius 3, 10–13 cm. longi, rhachi membranaceo-alato 1 mm. lato, spiculas binas in ordinibus duobus ferente, in margine basin versus sparse longeque ciliato, ad axis principalis junctionem piloso, aliter glabro marginibus et costa media et pedicellis scabris exceptis. Spiculae turgidae, elliptici-obovatae, acutae, glabrae, albo-virides saepe purpureo-coloratae, circa 2.7 mm. longae, 1.5 mm. latae, aliquando 2-florae,— inferior staminifera, superior hermaphrodita; gluma prima plerumque adest, quintam partem vel etiam dimidiam partem spiculae longitudine aequans, truncata vel acuminata, 1-nervata cum nervo scabro; gluma secunda 5-nervata, quam lemma sterile brevior; lemma sterile 5-nervatum, fructus superans, ad apicem incrassatum puberulumque; palea sterilis aliquando adest, indurata; fructus ellipsoidalis, circa 2.2 mm. longus, 1.4 mm. latus.— Type (in the Gray Herb.) and only specimen seen, pine ridge near Manatee Lagoon, July 18, 1905, *M. E. Peck*, no. 71. *P. Peckii* belongs to the section *Monostachya* and is most nearly allied to *P. pilosum* Lam. (*Panicum monostachyum* HBK. not *Paspalum monostachyum* Vasey), but differs from it in the greater number of racemes [*P. pilosum* occasionally has 2, but usually only 1], the longer less pubescent leaf-blades and the thinner sterile lemma. I wish to thank Mrs. Chase for her kindness in comparing the Peck specimen with the material at Washington and for her notes relating to its difference from other species of this group.

PASPALUM PECTINATUM Nees, Agrost. Bras. 34 (1829).— Pine ridge, Ycacos Lagoon, March 1, 1907, *M. E. Peck*, no. 680. Determined by Mrs. Chase who states that they have (in Washington) only one North American collection of this species, Costa Rica, *Biolley*, no. 2651. *P. pectinatum* is a South American species.

PASPALUM PEDUNCULATUM Poir. in Lam. Encycl. Suppl. **4**: 315 (1816).— Pine ridge near Manatee Lagoon, August 8, 1905, *M. E. Peck*, no. 110.

PASPALUM PULCHELLUM HBK. Nov. Gen. et Spec. **1**: 90, t. 26 (1816).— Pine ridge near Manatee Lagoon, July 31, 1905, *M. E. Peck*, no. 86. Previously reported from Cuba, Hispaniola, Barbados and South America; new for Central America.

PASPALUM SCHREBERIANUM (Flügge) Nash in No. Am. Fl. **17**: 190 (1912).— Wet pine ridge near Manatee Lagoon, July 18, 1905, *M. E. Peck*, no. 69 a. Determined by Mrs. Chase. The specimen (in the Gray Herb.) consists of two inflorescences which were tied with no. 69, *Paspalum Underwoodii* Nash, and extends the range to Central America as the former distribution was the West Indies and South America.

PASPALUM UNDERWOODII Nash in Bull. Torr. Bot. Club, **30**: 375 (1903).— Wet pine ridge near Manatee Lagoon, July 18, 1905, *M. E. Peck*, no. 69. Determined by Mrs. Chase. A West Indian species not previously reported from Central America.

PANICUM CHRYSOPSIDIFOLIUM Nash in Small, Fl. Southeast U. S. 100 (1903).— Forest near Sibune R., May 8, 1906, *M. E. Peck*, no. 425. Previously reported from Florida, Louisiana, Cuba and Porto Rico; new for Central America.

PANICUM CYANESCENS Nees Agrost. Bras. 220 (1829).— Low pine ridge near Manatee Lagoon, January 5, 1906, *M. E. Peck*, no. 271, A variable species resembling *P. parvifolium* Lam., but more upright, with longer leaves and larger panicle. It is a South American species apparently new to North America. The references to *P. cyanescens* in Hemsl. Biol. Cent.-Am. Bot. **3**: 487 (1885) and Fourn. Mex. Pl. **2**: 20 (1886) are probably misapplications of the name and referable to *P. parvifolium*. *Wright*, no. 3459 cited by Fournier is according to Prof. A. S. Hitchcock's notes on this number in the Gray Herbarium a mixture of *P. parvifolium* Lam. and *P. nitidum* Lam.

PANICUM FASCICULATUM Sw. Prodr. Veg. Ind. Occ. 22 (1788).— Cultivated ground near Manatee Lagoon, January 27, 1906, *M. E. Peck*, no. 317.

PANICUM FUSIFORME Hitchc. Contr. U. S. Nat. Herb. **12**: 222 (1909). — Pine ridge near Manatee Lagoon, July 7, 1906, *M. E. Peck*, no. 453a. Distribution previously limited to the extreme southeastern portion of the United States and Cuba. New for Central America.

PANICUM LAXUM Sw. Prodr. Veg. Ind. Occ. 23 (1788).— Pine ridge near Manatee Lagoon, June 21, 1905, *M. E. Peck*, no. 60.

PANICUM MAXIMUM Jacq. Coll. Bot. **1**: 76 (1786).— Thickets near Manatee Lagoon, November 10, 1905, *M. E. Peck*, no. 195.

PANICUM PILOSUM Sw. Prodr. Veg. Ind. Occ. 22 (1788).— Pine ridge near Manatee Lagoon, June 10, 1905, *M. E. Peck*, no. 28.

PANICUM PULCHELLUM Raddi, Agrost. Bras. 42 (1823).— Pine ridge near Manatee Lagoon, January 8, 1906, *M. E. Peck*, no. 279.

PANICUM RUDGEI R. & S .Syst. Veg. **2**: 444 (1817).— Pine ridge, Monkey R., December 26, 1906, *M. E. Peck*, no. 588.

PANICUM SPHAEROCARPON Ell. Sketch **1**: 125 (1816).— Pine ridge near Manatee Lagoon, June 21, 1905, *M. E. Peck*, no. 61.

Panicum stenodoides, sp. nov., perenne, virgulta e caudice noduloso formans, circa 30 cm. altitudine, olivaceum, radicibus paullum carnosis. Culmi erecti, tenues, firmiusculi, basin versus toto vel fere glabri, supra papilloso-pilosi, nodis glabris. Vaginae infimes squami-

formes, glabrae, superiores breves, circa 2 cm. longae, patente papilloso-pilosae, abrupte ad folii junctionem contractae. Ligula membranacea, brevissima, 0.25 mm. longa. Folia erecta, rigidiuscula linearia, subtus plana apicem versus involuto-setacea, 5–14 cm. longa, 1–2 mm. lata, lamina utrinque papilloso-pilosa. Paniculae terminales, solitariae vel per occasionem cum secunda breviori ex axe eodem producta, breve exsertae vel ad basin inclusae, plerumque bractea parva setiforme suffultae, circa 1 cm. longae, 2–4 mm. diametro, 5–7-spiculatae, axe pedicelloque scabris. Spiculae obtusae, turgidae, paullum ad basin attenuatae, 2 mm. longae, circa 1.5 mm. latae, valde nervatae; gluma prima quam spicula duplo brevior, 3-nervata, acuta; gluma secunda 9-nervata, lemma sterile 9-nervatum aequans; fructus ellipsoidalis, acutus, circa 1.7 mm. longus, 1 mm. latus, paullum glumam secundam et lemma sterile superans.— Type (in the Gray Herb.) and only specimen seen, low pine ridge, Ycacos Lagoon, March 5, 1907, *M. E. Peck*, no. 681. This species belongs to the small section *Tenera* as characterized in Hitchc. & Chase, Contr. U. S. Nat. Herb. **15**: 97 (1910). It is very similar to *P. stenodes* Griseb. and *P. caricoides* Nees, but differs from the former in having pilose culms, sheath and leaves and larger spikelets; from the latter it differs very noticeably in the absence of long stiff hairs on the pedicel.

Panicum trichanthum Nees, Agrost. Bras. 210 (1829).— Open ground, Toledo, March 27, 1907, *M. E. Peck*, no. 775. The Peck specimen is rather stouter and the spikelets slightly larger than usual.

Panicum trichoides Sw. Prodr. Veg. Ind. Occ. 24 (1788).— Clearing near Manatee Lagoon, January 27, 1906, *M. E. Peck*, no. 314; open ground, Toledo, February 2, 1907, *M. E. Peck*, no. 637.

Panicum virgatum L. Sp. Pl. ed. 1, **1**: 59 (1753).— Swamp near Manatee Lagoon, July 18, 1905, *M. E. Peck*, no. 73; swamp near Manatee Lagoon, August 13, 1905, *M. E. Peck*, no. 123.

Panicum (§ Ptychophyllum) crus-ardeae Willd. ex Nees, Agrost. Bras. 253 (1829).— Forest, upper Moho R., October 18, 1906, *M. E. Peck*, no. 565. The proper position of the section *Ptychophyllum* seems to be very uncertain. By some it is considered a section of *Setaria* while by others it is retained in *Panicum*. As this species has never been transferred to *Setaria*, I am maintaining the old name though presumably its affinity is more with *Setaria* than *Panicum*.

Ichnanthus pallens (Sw.) Doell in Mart. Fl. Bras. **2**^{2}: 290 (1877). — Forest near Manatee Lagoon, October 18, 1905, *M. E. Peck*, no. 172; forest near Manatee Lagoon, January 27, 1906, *M. E. Peck*, no. 312.

LASIACIS DIVARICATA (L.) Hitchc. Contr. U. S. Nat. Herb. **15**: 16 (1910). *Panicum divaricatum* L. Syst. Nat. ed. 10, **2**: 871 (1759).— Thicket near Manatee Lagoon August 2, 1905, *M. E. Peck*, no. 93.

LASIACIS GRISEBACHII (Nash) Hitchc. in Bot. Gaz. **51**: 302 (1911). *Panicum Grisebachii* Nash in Bull. Torr. Bot. Club **35**: 301 (1908).— Forest near Manatee Lagoon, November 10, 1905, *M. E. Peck*, no. 197. A species apparently hitherto restricted to Cuba.

LASIACIS PROCERRIMA (Hack.) Hitchc. ex Chase in Proc. Biol. Soc. Wash. **24**: 145 (1911). *Panicum procerrimum* Hack. in Oesterr. Bot. Zeitschr. **51**: 431 (1901).— Forest near Manatee Lagoon, August 6, 1905, *M. E. Peck*, no. 107.

LASIACIS sp.— Pine ridge, Monkey R., December 28, 1906 *M. E. Peck*, no. 593. This may be *Panicum martinicense* Griseb. Fl. Brit. W. Ind. 552 (1864), as it answers the description and is reported by Grisebach as coming from Jamaica [Martinique!, Panama!, Guiana!]. The identity of Grisebach's species is, however, at present uncertain and consequently it is unwise to make a new combination. Prof. Hitchcock writes me that a specimen of *Sieber*, no. 29 from Martinique (cited by Grisebach) is *Lasiacis Swartziana* Hitchc., though this particular specimen may not be the one from which Grisebach drew his description.

SACCIOLEPIS VILVOIDES (Trin.) Chase in Proc. Biol. Soc. Wash. **21**: 7 (1908).— Wet pine ridge, Ycacos Lagoon, May 15, 1905, *M. E. Peck*, no. 901. This species has been previously reported from southern Mexico and Brazil.

HOMOLEPIS ATURENSIS (HBK.) Chase in Proc. Biol. Soc. Wash. **24**: 146 (1911).— Pine ridge near Manatee Lagoon, June 18, 1905, *M. E. Peck*, no. 45.

OPLISMENUS BURMANNII (Retz.) Beauv. Agrost. 54 (1812).— Forest near Manatee Lagoon, February 22, 1906, *M. E. Peck*, no. 349.

SETARIA IMBERBIS (Poir.) R. & S. Syst. Veg. **2**: 891 (1817).— Cultivated ground, Toledo, September 9, 1906, *M. E. Peck*, no. 491.

OLYRA LATIFOLIA L. Amoen. Acad. (Pugill. Jam.) **5**: 408 (1759).— Forest near Manatee Lagoon, August 8, 1905, *M. E. Peck*, no. 109; in the same collection but without more precise data, *M. E. Peck*, no. 609.

OLYRA LATIFOLIA L. forma.— Thicket, Toledo, September 21, 1906, *M. E. Peck*, no. 533. A narrow-leaved form.

LITHACHNE PAUCIFLORA (Sw.) Beauv. Agrost. 135, 168 (1812) by implication only, no combination made,— cf. Ind. Kew. **2**[1]: 98 (1895). *Olyra pauciflora* Sw. Prodr. Veg. Ind. Occ. 21 (1788). *L.*

axillaris Beauv. Agrost. 166, Atlas 15, t. 24 f. 2 (1812).— Forest, Toledo, September 12, 1906, *M. E. Peck*, no. 507.

ARISTIDA DIVARICATA Humb. & Bonpl. ex Willd. Enum. Hort. Berol. 99 (1809).— Pine ridge near Manatee Lagoon, July 18, 1905, *M. E. Peck*, no. 72.

Aristida pseudospadicea, sp. nov., perennis, dense caespitosa, circa 80 cm. altitudine, radicibus fibrosis. Culmi erecti, tenues sed rigidi, basin versus aliquid ramosi, supra simplices, albo-virides, ad nodos purpurascentes, omnino glabri. Vaginae e basi imbricata tumidiuscula paullum angustatae, in parte superiori culmos laxissime includentae vel patentes, quam internodia multo breviores, glabrae, ad folii junctionem angulo recto abruptissime contractae et cum annulo atro-brunneo cinctae. Ligula annularis brevis hispida in auriculas vaginae procurrens, circa. 0.2 mm. longa. Folia baseos superioribus similia, erecta, plana vel conduplicata, longe setaceo-acuminata, 8–30 cm. longa, 1–2 mm. lata; lamina subtus glabra, supra sparse longe tenuiterque pilosa basin versus pilis crebrioribus instructa. Inflorescentia panicula simplex, gracilis; 20–26 cm. longa, 2–4 cm. diametro; radiis in axillis solitariis (per occasionem secundo breviore), adpressoascendentibus vel paullo patentibus, inferioribus remotis; axe radiisque glabris. Spiculae glabrae, albo-virides vel paullum albo-violaceae, 9–11 mm. longae, circa 1 mm. diametro, callo obconico in summa parte barbato, circa 1 mm. longo; glumae carinatae, 1-nervatae, gluma prima in nervo scabra, acuminata, quam secunda aliquanto breviori, gluma secunda aristato-acuminata vel paullum bifida cum arista brevi; lemma quam gluma secunda longius, ad apicem aliquid tortum, scabrum, partibus tribus aristae divaricatis, subaequantes vel lateralibus multo brevioribus, parti media ad 35 mm. longa; palea circa 1 mm. longa.— Type (in the Gray Herb.) and only specimen seen, pine ridge near Manatee Lagoon, June 11, 1905, *M. E. Peck*, no. 31. *A. pseudospadicea* is most nearly allied to *A. spadicea* HBK. from which it differs in its more slender habit, absence of flat curled basal leaves, long-pilose upper leaf-surface and smaller spikelets. Similar differences separate it from *A. arizonica* Vasey. The comparatively long callus separates it at once from *A. tincta* Trin. & Rupr. which has a very short one. I wish to thank Mrs. Chase for comparing the material with that at Washington.

SPOROBOLUS CUBENSIS Hitchc. Contr. U. S. Nat. Herb. **12**: 237 (1909).— Pine ridge, Ycacos Lagoon, March 5, 1907, *M. E. Peck*, no. 694. A Cuban and Porto Rican species apparently new for Central America.

SPOROBOLUS VIRGINICUS (L.) Kunth, Rev. Gram. **1**: 67 (1829).— Low ground near Manatee Lagoon August 10, 1905, *M. E. Peck*, no. 120.

SPARTINA GOUINI [2] Fourn. ex Hemsl. Biol. Cent.-Am. Bot. **3**: 509 (1885) nomen; Fourn. Mex. Pl. **2**: 135 (1886).— Swampy shore of Manatee Lagoon, August 14, 1905, *M. E. Peck*, no. 130. Previously collected in Mexico only. The Peck material agrees perfectly with a specimen, in the Gray Herbarium, labelled *Spartina densiflora* Brongn. (*S. Gouini* Fourn.!) [alkaline meadows, Hacienda de Angostura, San Luis Potosi, Mexico, July 10, 1891, *C. G. Pringle*, no. 3760]. Judging from Brongniart's description of *S. densiflora* (a Chilean species) in which he calls attention to its affinity to *S. glabra* Muhl. I doubt very much that the Mexican *S. Gouini* is the same and a Chilean specimen in the Gray Herbarium, labelled *S. densiflora* Brongn. [Valdivia: Ensenada bei Corral, in Gräben 5/1 1905, *Dr. Otto Buchtien*, no. 1285] certainly is not the same as *Pringle*, no. 3760, but shows a strong resemblance to *S. glabra* Muhl.

LEPTOCHLOA FILIFORMIS (Lam.) Beauv. Agrost. 71, 166 (1812). *L. mucronata* (Michx.) Kunth. Rev. Gram. **1**: 91 (1829).— Clearing near Manatee Lagoon, January 21, 1906, *M. E. Peck*, no. 296.

ELEUSINE INDICA (L.) Gaertn. Fruct. **1**: 8 (1788).— Cultivated ground near Manatee Lagoon, June 8, 1905, *M. E. Peck*, no. 43.

ERAGROSTIS ELLIOTTII Wats. in Proc. Am. Acad. **25**: 140 (1890).— Pine ridge near Manatee Lagoon, November 25, 1905, *M. E. Peck*, no. 222a. Not previously reported from Central America, former distribution southeastern United States, Cuba and Porto Rico.

ERAGROSTIS HYPNOIDES (Lam.) BSP. Prelim. Cat. N. Y. Pl. 69 (1888).— Swamp near Sibune R., May 1, 1906, *M. E. Peck*, no. 143.

ERAGROSTIS MEXICANA (Lag.) Link, Hort. Berol. **1**: 190 (1827).— Wet pine ridge near Manatee Lagoon, July 18, 1905, *M. E. Peck*, no. 69b.

ERAGROSTIS sp.— affinis *E. acutiflorae* (HBK.) Nees.— Pine ridge near Manatee Lagoon, January 8, 1906, *M. E. Peck*, no. 281a. The Peck material is too immature to determine more definitely than above. Mrs. Chase has kindly compared this with the material at Washington and has been unable to identify it.

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[2] Since the preparation of this article Prof. A. S. Hitchcock's paper on Mexican Grasses [Contr. U. S. Nat. Herb. **17** (1913)] has appeared. In this,— pages 329, 330,— he refers *Pringle*, no. 3760 to *S. spartinae* (Trin.) Merr. U. S. Bur. Pl. Ind. Bull. **9** : 11 (1902). I have no doubt that he is correct in so doing; consequently the Peck material should be named *S. spartinae* (Trin.) Merr.

ARUNDINARIA? — Lower Moho R., October 16, 1906, *M. E. Peck*, no. 560. Without inflorescence, probably an *Arundinaria*, possibly *A. longifolia* Fourn.

V. DIAGNOSES AND TRANSFERS AMONG THE SPERMATOPHYTES.

BY B. L. ROBINSON.

IN the course of routine work at the Gray Herbarium during the last few months the writer has found it necessary to employ a number of new names, resulting either through transfers of the plants in question or rendered needful by the provisions of the International Rules of Botanical Nomenclature. That these names may have proper status they are here given published record, together with a few diagnoses of new species. Two plants characterized at the Gray Herbarium by Mr. Sidney F. Blake and a transfer made by Mr. Sumner C. Brooks are included by request.

Inga (§ **Diadema**) **Peckii,** spec. nov., pedunculis exceptis glabra; ramis teretibus cortice griseo a lenticellis numerosis scabrato tectis plus minusve geniculatis; foliolis 2–3-jugis oblongis petiolulatis subcoriaceis supra subnitidis subtus opacis vel subglaucescentibus apice basique acuminatis 9–17 cm. longis 3.5–7.5 cm. latis penninerviis; petiolulis 4–6 mm. longis; rhachi commune ca. 1.5 dm. longo striato-angulato exalato; pedunculis brevibus gracilibus ex eodem axillo plurimis; receptaculo ovoideo, capitibus globosis saepius 12–18-floris; floribus sessilibus; calyce ca. 2 mm. longo subcylindrato margine brevissime dentato obsolete hispidulo-ciliato aliter glabro; corolla glabra graciliter tubulata sursum leviter gradatimque ampliata, dentibus limbi brevissimis deltoideis; tubo staminum exserto; legumine glabro falcato-oblongo ca. 13 cm. longo ca. 2.2 cm. lato 11-seminato.— British Honduras, *Prof. Morton E. Peck*, no. 673 (type, in Gray Herb.). A species nearly related to *I. jinicuil* Schlecht. but differing in its much shorter peduncles, thicker duller and less reticulated leaflets, shorter corolla-teeth, exserted stamen-tube, etc. From the imperfectly described and wholly obscure *I. coriacea* (Moc. & Sess.) G. Don it differs in having leaflets symmetrical not oblique at the base.

Acacia bucerophora, spec. nov., fruticosa vel arborea; ramis tereti-

bus, cortice griseo pustulis suberosis fulvis maculato; aculeis infrastipularibus geminis rigidis patenti-ascendentibus arcuatis cavis 4–6 cm. longis basi 5 mm. diametro apicem attenuatam versum cum foramine verisimiliter a formicis facto munitis; foliis ca. 2 dm. longis ca. 8 cm. latis; petiolo 1 cm. longo subtereti supra canaliculato; pinnae 14–16-jugis lineari-oblongis contiguis vel etiam imbricatis falcatis basi obliquis apice rotundatis ca. 6 mm. longis 1 mm. latis glabris subtus pallidioribus; inflorescentiis globosis usque ad 15 ex eodem axillo; pedunculis brevibus 1–2.5 cm. solum longis ca. 2–4 mm. supra basin cum involucro annulari squamuliformi saepius 3-partito instructis nec non media in parte cum involucello simili munitis; calyce subcylindrico parum superne ampliato breviter 4-dentato; corolla breviter exserta glabra; legumine sessili falcato-lineari ca. 14 cm. longo 6 mm. solum lato margine valde incrassato faciebus concavis glabris apice basique attenuato.— British Honduras, *Prof. Morton E. Peck*, no. 632 (type, in Gray Herb.). Another species of the highly interesting ant-inhabited Acacias like *A. sphaerocephala* Cham. & Schlecht., *A. spadicigera* Cham. & Schlecht., *A. Hindsii* Benth., etc., but differing from all these markedly in the double involucre of the peduncles, as well as in the long narrow pod, and various other features.

SESBANIA VESICARIA (Jacq.) Ell., var. **atro-rubra** (Nash) S. C. Brooks, comb. nov. *Glottidium floridanum* (Willd.) DC., var. *atro-rubrum* Nash, Bull. Torr. Bot. Club, xxiii. 101 (1896). *G. vesicarium atrorubrum* (Nash) Small, Fl. S. E. U. S. 615 (1903).

Aeschynomene tenerrima, spec. nov., herbacea gracilis palustris ca. 5 dm. alta ubique glaberrima; caule tereti pallide brunneo deorsum leviter spongiose incrassato supra gracillimo paucirameo, ramis ascendentibus subfiliformibus; foliis 2–3.5 cm. longis brevissime petiolatis; rhachi filiformi; foliolis ca. 18-jugis minutis oblongis basi obliquis apice rotundatis 2–2.3 mm. longis 1 mm. latis utrinque pallide viridibus concoloribus; racemis axillaribus 2–3-floris gracillimis; bracteis lanceolatis subscarioso-brunneis vel -purpureis vix 1 mm. longis; floribus anthesi ca. 2.8 mm. longis; calyce herbaceo pallide viridi plus minusve bilabiato, fructifero persistenti brunnescenti; petalis violascentibus ca. 2–2.5 mm. longis; legumine longe (ca. 5 mm.) graciliterque stipitato valde ex calice exserto, articulo unico semiorbiculari 4 mm. longo glabro margine incrassato apice cum styli basi torta vel curvata appendiculato faciebus leviter reticulato-venosis.— Swamp near Yeaco Lagoon, British Honduras, 15 May, 1907, *Prof. Morton E. Peck*, no. 900 (type, in Gray Herb.). A very delicate palustrine species with exceedingly small leaflets and inconspicuous

flowers, not closely related to any other Mexican or Central American species, though clearly of the genus.

WISSADULA SPICATA (HBK.) Presl, Rel. Haenk. ii. 117 (1830). *Abutilon spicatum* HBK. Nov. Gen. et Spec. v. 271 (1821). To the synonymy of this species may be added *Wissadula elongata* Brandegee, Zoe, v. 210 (1905), from Cofradia in the vicinity of Culiacan, Sinaloa.

Linociera oblanceolata, spec. nov., fruticosa vel arborea; ramis gracilibus teretiusculis cortice griseo tectis; ramulis fulvido-puberulis; foliis vix coriaceis oblanceolatis utrinque glabris 11–13 cm. longis 3.5–4.2 cm. latis apice caudato-acuminatis basi sensim angustatis, petiolo proprio teretiusculo puberulo 3–4 mm. solum longo; paniculis laxis 6–8 cm. longis gracillimis ex axillis superioribus foliorum verorum oriuntibus flavido-puberulis; floribus graciliter 3–5 mm. longe pedicellatis; calycis lobis ovatis acuminatis patentibus 1.2 mm. longis flavido-puberulis; petalis margine valde involutis caudiformibus 7–10 mm. longis; antheris 1 mm. longis obtusis, filamentis brevissimis, connectivo apice non productis; fructu crassiuscule clavato 1.9 cm. longo 8 mm. diametro in specimine sicco nigrescente.— Forest, upper Moho River, British Honduras, 16 March, 1907, *Prof. Morton E. Peck*, no. 719 (type, in Gray Herb.). This species differs from *L. caribaea* (Jacq.) Knobl. by its unappendaged anthers. From *L. Bakeri* Urb. of Cuba it may be distinguished by its larger oblanceolate acuminate and even more shortly petioled leaves.

Strychnos (§ **Longiflorae**) **Peckii**, spec. nov., fruticosa cirrhifera; ramis subteretibus a cortice griseo laevi tectis; ramulis gracilibus rectis patentissimis plus minusve sulcatis fulvo-puberulis apicem versus saepissime bifoliatis; cirrhis spiraliter aduncis 2–3 cm. longis usque ad 4 mm. crassis lignescentibus; foliis ovato-ellipticis acute acuminatis 7–11 cm. longis 3.4–5 cm. latis firme membranaceis glabris supra viridibus laevibus subtus distincte pallidioribus obscure punctiulatis 5-nervatis, nerviis saltim basim versus minutissime strigillosis; inflorescentiis axillaribus brevibus multifloris subglobosis glomeruliformibus; bracteis lineari-lanceolatis 3–4 mm. longis, bracteolis minutis obscurisque; pedicellis brevibus fulvo-puberulis; calyce rotato 5-lobo, lobis ovatis acuminatis patentibus ciliolatis; corolla 1 cm. longa, tubo cylindrato 7 mm. longo extus patente fulvo-tomentello, lobis patentibus acutatis supra ut faucibus dense flavo-barbatis; antheris anguste oblongis vix exsertis; stylo nunc modice nunc vix exserto.— Forest, Sittee River, British Honduras, 15 April, 1907, *Prof. Morton E. Peck*, no. 856 (type, in Gray Herb.). This species appears to approach *S. Erichsonii* Rich. Schomb. of British Guiana,

but the latter (known to the writer only from Progel's description in the Flora Brasiliensis, vi. pt. 1, 274) is said to have coriaceous leaves about three times as long as broad, and a corolla which is granulose-pulverulent on the outside. Furthermore, the figure of the corolla (Progel, l. c., t. 82, f. II.) shows the bearding only at the throat, while in the species here characterized it extends well out upon the lobes.

Gymnolomia acuminata Blake, spec. nov., herbacea ramosa strigoso-hispida caule tenui; foliis inferioribus oppositis superioribus alternis lanceolatis longe acuminatis crenulato-serrulatis basi cuneatis utrinque scabro-hispidis infra sparse glandulosis 5–8 cm. longis 1.2–1.8 cm. latis petiolis submarginatis 1 cm. longis dense hispido-strigosis basi ampliatis; ramis floriferis tenuibus ad apicem 3–5-capitulatis cum bracteis paucis linearibus subsessilibus munitis; capitulis longe (2.5–7.5 cm.) pedunculatis subglobosis 8–9 mm. diametro (radiis exclusis); disco convexo; involucri 6–7 mm. alti squamis triseriatis dense strigillosis interioribus ovalibus 3.5 mm. latis exterioribus duplo brevioribus late oblongis 2 mm. latis; radiis plerumque 8 flavis late oblongis subintegris 8 mm. longis; corollis disci flavis 3.5 mm. longis basi non ampliatis 10-nervatis glabris; styli ramis brevibus clavatis apice incrassatis breviappendiculatis; paleis subtruncate tridentatis apice pilosis; acheniis glabris atris oblongis incrassatis epapposis multistriatis 2.1 mm. longis apice obliquis.— Prope Gómez Fárias, Tamaulipas, Mexico, 13–21 April 1907, *Palmer* 582 (spec. typ. in herb. Grayano).—Species ad *G. latibracteatam* Hemsl. arcte affinis, foliis infra hispido-strigosis capitulis minoribus squamis strigosis non minute strigillosis bene distincta.

Flourensia retinophylla Blake, spec. nov. frutex ramosissima cortice brunneo-canescente ramulis junioribus viscido-glutinosis; foliis anguste lanceolatis integerrimis utroque acuminatis mucronulatis glutinosis in petiolum brevisissimum marginatum angustatis 2.5–3.5 cm. longis 4–7.5 mm. latis punctatis venis reticulatis costa valida; capitulis in apicibus ramulorum dense racemosis (3–6) discoideis ca. 12-floris glutinosis turbinatis 10–12 mm. altis; pedunculis brevibus 1–3-bracteolatis; involucri 8 mm. alti squamis laxis 2–3-seriatis oblongo-lanceolatis subobtusis luteo-viridibus; paleis firmis obtusis mucronatis ca. 3-nervatis 8.5–9.8 mm. longis; corollis luteis 5 mm. longis (tubulo 1.1 mm.) dentibus apice resinosis; acheniis cuneatis 6 mm. longis leviter incrassatis dense villosis, aristis 2 serrulatis basi subampliatis 3 mm. longis, squamellis nullis.— Sierra de la Paila, Coahuila, Mexico, Nov. 1910, *Purpus* 4728 (spec. typ. in herb. Grayano conservatum).— Planta ut *F. laurifolia* DC. distributa, a qua

foliis parvis anguste lanceolatis et capitulis minoribus brevipeduculatis et floribus paucioribus satis differt.

JAUMEA TENUIFOLIA (Sch. Bip.) Klatt, Leopoldina, xxiii. 146 (1887), p. 6 of reprint. *Neurolaena tenuifolia* Sch. Bip. acc. to Klatt, l. c. This species, imperfectly characterized by Dr. Klatt, is shown by his fragments of type material to have rested upon a very immature specimen of some plant with pappus of capillary bristles and with the young corollas (still closed) purplish-tomentose. Though from the fragments at hand it is impossible to place the species in any genus, it may be said with perfect definiteness that the plant, with its fine capillary pappus, is not a *Jaumea*. Its habit is rather that of a *Eupatorium* than of a *Neurolaena*, but the florets are too immature to furnish distinctive generic or even tribal characters. The type number (*Liebmann*, no. 202 from Chinantla, Mexico) is doubtless in other herbaria and may well be in some of them represented in sufficiently mature condition to permit more precise identification. Information on this subject would be welcomed.

OXYPAPPUS SCABER Benth. Bot. Sulph. 118, t. 42 (1844). There seems to be no doubt that Dr. Gray was entirely right in reducing to the synonymy of this species *Pentachaeta gracilis* Benth. in Hook. Ic. xii. 1, t. 1101 (1872), though the latter is maintained as a valid species by Hooker f. & Jackson in the Index Kewensis.

Schkuhria schkuhrioides (Link & Otto), comb. nov. *Achyropappus schkuhrioides* Link & Otto, Ic. Pl. Rar. 59, t. 30 (1828). *Schkuhria senecioides* Nees, Del. Sem. Hort. Bonn. 1831; Hemsl. Biol. Cent.-Am. Bot. ii. 212 (1881).

Actinea Palmeri (Gray), comb. nov. *Actinella Palmeri* Gray, Proc. Am. Acad. xix. 31 (1883). *Plateilema Palmeri* (Gray) Cockerell, Bull. Torr. Bot. Club, xxxi. 462 (1904).

ACTINEA SCAPOSA (DC.) Ktze., var. **linearis** (Nutt.), comb. nov. *Actinella scaposa*, β *linearis* Nutt. Trans. Am. Phil. Soc. vii. 379 (1841). *Tetraneuris linearis* (Nutt.) Greene, Pittonia, iii. 267 (1898).

DYSSODIA Cav. The various efforts which have been made to separate *Hymenatherum* Cass. from *Dyssodia* Cav. have proved so unsatisfactory that it seems best to follow Hoffmann in Engl. & Prantl, Nat. Pflanzenf. iv. Ab. 5, 265 (1890), and regard the distinctions as being at best of subgeneric or sectional value. In accordance with this view, however, it is necessary to transfer several species, as follows:

Dyssodia anomala (Canby & Rose), comb. nov. *Hymenatherum anomalum* Canby & Rose, Contrib. U. S. Nat. Herb. i. 105, t. 7 (1891).

D. aurantia (L.), comb. nov. *Aster aurantius* L. Sp. Pl. ii. 877 (1753). *Aster americanus, foliis pinnatis*, etc., Rel. Houst. 7, t. 18 (1781). *Dysodia appendiculata* Lag. Nov. Gen. et Spec. 29 (1816). *Clomenocoma aurantia* (L.) Cass. Dict. Sci. Nat. ix. 416 (1817), lix. 66 (1829). *Clappia aurantiaca* Benth. in Hook. Ic. xii. t. 1104 (1872).

D. aurantiaca (Brandegee), comb. nov. *Hymenatherum aurantiacum* Brandegee, Zoe, v. 258 (1908).

D. pentachaeta (DC.), comb. nov. *Hymenatherum Berlandieri* DC. Prod. v. 642 (1836). *H. pentachaetum* DC. l. c.; Gray, Proc. Am. Acad. xix. 42 (1883), where the two species of DeCandolle are united under the name of the latter from the standpoint of priority of position. *Thymophylla pentachaeta* (DC.) Small, Fl. S. E. U. S. 1295, 1341 (1903). In making the transfer to *Dyssodia* the author would have preferred to reinstate the first name employed by DeCandolle, but this is forbidden by Art. 46 of the International Rules, which reads, " When two or more groups of the same nature are united, the name of the oldest is retained. If the names are of the same date, the author chooses, and his choice cannot be modified by subsequent authors." In the case in hand, the two names *Berlandieri* and *pentachaetum* were of the same date. The species seem first to have been united by Gray, who chose the second of the two names, and this, of course, is decisive according to the article just quoted.

D. concinna (Gray), comb. nov. *Hymenatherum concinnum* Gray, Syn. Fl. i. pt. 2, 446 (1884).

D. diffusa (Gray), comb. nov. *Hymenatherum diffusum* Gray, Pl. Wright. i. 116 (1852).

D. Greggii (Gray), comb. nov. *Thymophylla Greggii* Gray, Pl. Fendl. 92 (1849). *Thymophyllum Greggii* (Gray) Hemsl. Biol. Cent.-Am. Bot. ii. 221 (1881). *Hymenatherum Greggii* Gray, Proc. Am. Acad. xix. 42 (1883).

D. Hartwegi (Gray), comb. nov. *Hymenatherum Berlandieri* Benth. Pl. Hartw. 18 (1839), by error of determination, not DC. *H. Hartwegi* Gray, Pl. Wright. i. 117 (1852).

D. Neaei (DC.), comb. nov. *Hymenatherum ? Neaei* DC. Prod. v. 642 (1836). *H. boeberoides* Gray, Pl. Wright. i. 115 (1852). *H. Naei* Hemsl. Biol. Cent.-Am. Bot. ii. 220 (1881); Gray, Proc. Am. Acad. xix. 41 (1883).

D. neo-mexicana (Gray), comb. nov. *Adenophyllum Wrightii* Gray, Pl. Wright. ii. 92 (1853). *Hymenatherum neo-mexicanum* Gray, Proc. Am. Acad. xix. 40 (1883), not *H. Wrightii* Gray, Pl. Fendl. 89 (1849).

D. PAPPOSA (Vent.) Hitchc. Trans. St. Louis Acad. Sci. v. 503 (4 February, 1891). This combination is referred by Durand & Jackson, Ind. Kew. Suppl. 1, p. 147 (1902), to O. Kuntze, Rev. Gen. i. 334 (September, 1891). There can, however, be no question as to the priority of Prof. Hitchcock's publication, which was reviewed in the Bulletin of the Torrey Botanical Club, xviii. 91 (issued 10 March, 1891).

D. pinnata (Cav.), comb. nov. *Aster pinnatus* Cav. Ic. iii. 6, t. 212 (1795). *Dysodia pubescens* Lag. Nov. Gen. et Spec. 29 (1816). *D. subintegerrima* Lag. l. c. *Boebera incana* Lindl. Bot. Reg. t. 1602 (1833). *Dysodia incana* (Lindl.) DC. Prod. v. 640 (1836). *Boebera subintegerrima* (Lag.) Spreng. Syst. iii. 545 (1826). *Clomenocoma? pinnata* DC. Prod. v. 641 (1836). *Dysodia integerrima* Hemsl. Biol. Cent.-Am. Bot. ii. 219 (1881), by error for *D. subintegerrima*.

D. polychaeta (Gray), comb. nov. *Hymenatherum polychaetum* Gray, Pl. Wright. i. 116 (1852). *Thymophylla polychaeta* (Gray) Small, Fl. S. E. U. S. 1295, 1341 (1903).

D. setifolia (Lag.), comb. nov. *Thymophylla setifolia* Lag. Nov. Gen. et Spec. 25 (1816). *Thymophyllum setifolium* Hemsl. Biol. Cent.-Am. Bot. ii. 221 (1881). *Hymenatherum setifolium* (Lag.) Gray, Proc. Am. Acad. xix. 42 (1883).

D. Thurberi (Gray), comb. nov. *Hymenatherum tenuifolium* var.? Gray, Pl. Wright. ii. 93 (1853). *H. Thurberi* Gray, Proc. Am. Acad. xix. 41 (1883).

D. tenuiloba (DC.), comb. nov. *Hymenatherum tenuilobum* DC. Prod. v. 642 (1836). *H. tenuifolium* Gray, Pl. Wright. i. 118 (1852), by error of determination, not Cass. *Thymophylla tenuiloba* (DC.) Small, Fl. S. E. U. S. 1295, 1341 (1903).

D. Treculii (Gray), comb. nov. *Hymenatherum* n. sp.? no. 13 Gray, Pl. Wright. i. 116 (1852). *Hymenatherum Treculii* Gray, Proc. Am. Acad. xix. 42 (1883). *Thymophylla Treculii* (Gray) Small, Fl. S. E. U. S. 1295, 1341 (1903).

D. Wrightii (Gray), comb. nov. *Hymenatherum Wrightii* Gray, Pl. Fendl. 89 (1849). *Thymophylla Wrightii* (Gray) Small, Fl. S. E. U. S. 1295, 1341 (1903).

POROPHYLLUM DECUMBENS DC. Prod. v. 650 (1836). *Kleinia suffruticosa* Lodd. Bot. Cab. xvi. t. 1561 (1829), not Willd. This is one of many plants, which have been described solely from cultivated specimens. The stock was thought to have originally come from Mexico, but though first brought into cultivation as early as the twenties, it has never been rediscovered in Mexico or Central America.

Furthermore the species seems to have passed out of cultivation long ago and is now obscure. The object of the present note is merely to call attention to the fact that, judged from character and Loddiges' colored plate, the species would seem to be exceedingly close to if not entirely identical with *P. linifolium* (L.) DC., var. *brevifolium* (Hook. & Arn.) Bak. Fl. Bras. vi. pt. 3, 283, t. 80, f. 2 (1884), a maritime plant, native of Uruguay.

POROPHYLLUM RUDERALE and P. ELLIPTICUM. Urban, Symb. Ant. i. 467 (1900), unites these species under the name *P. ellipticum* Cass. Dict. Sci. Nat. xliii. 56 (1826). This course may have been suggested by the fact that *P. ellipticum* Cass., a mere renaming of the original *Cacalia Porophyllum* L. Sp. Pl. ii. 834 (1753), in a certain sense perpetuates the earlier element in the combined species. However, the course is contrary to the International Rules of Botanical Nomenclature, which in Art. 46 are as follows: "Dans le cas de réunion de deux ou plusieurs groupes de même nature, le nom le plus ancien subsiste."[3] In this case the oldest available name (the Linnaean specific name being rejected on account of its identity with the generic name) is *ruderale*, which going back to *Kleinia ruderalis* Jacq. Enum. 28 (1760), much antedates *ellipticum* of Cassini.

The writer fully concurs with Prof. Urban that the two plants should be treated as mere varieties of the same species. The following naming will correspond to the requirements of the International Rules.

P. RUDERALE (Jacq.) Cass. Dict. Sci. Nat. xliii. 56 (1826), at least as to name-bringing synonym. *Kleinia ruderalis* Jacq. Enum. 28 (1760). *Cacalia ruderalis* (Jacq.) Sw. Prod. 110 (1788). *Porophyllum ellipticum*, var. *β ruderale* (Cass.) Urb. Symb. Ant. i. 468 (1900).

P. ruderale, var. **ellipticum** (Cass.) Gray in herb. *P. ellipticum* Cass. Dict. Sci. Nat. xliii. 56 (1826).

FAUJASIA FLEXUOSA (Lam.) Benth. & Hook. f. Gen. Pl. ii. 443 (1873) acc. to Hook. f. & Jacks. Ind. Kew. i. 948 (1893). Identical with this species appears to be *Cacalia cuspidata* Klatt, Ann. Sci. Nat.

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[3] It may be noted here that the English translation is inaccurate and misleading. It runs "When two or more groups of the same nature are united, the name of the oldest is maintained." In this very case it may be seen that the name of the older species is *ellipticum* for that species (under another designation, it is true) dates back to 1753, indeed even into pre-Linnaean times, while on the other hand the oldest (available) specific name is *ruderale*, dating from 1760. Thus it is clear that the English translation by the use of the expression "the name of the oldest" instead of "the oldest name" is capable of quite another interpretation from the official French version, "le **nom le** plus ancien," which happily, as well as the German "der älteste Name," is unequivocal.

ser. 5, xviii. 374 (1873), the type of which, collected on the Isle of Bourbon by Richard, is now in the Gray Herbarium. Other specimens of *F. flexuosa* at hand show the species to have a fairly wide range of variation as to leaf-contour, in some cases reaching the short, subcordate, conspicuously cuspidate-caudate form of Klatt's type, in others passing to elongate lance-oblong shapes more or less cuneate at the base.

Celmisia Cass. Dict. Sci. Nat. vii. 356 (1817). This genus of the *Senecioneae* was founded by Cassini upon a single South African species, which he called *C. rotundifolia* and which later proved to have been the plant previously named *Arnica tabularis* by Thunberg, Prod. Fl. Cap. 154 (1800). The genus *Celmisia*, thus having been originally based upon a single species, there can be no question as to its type. Furthermore, the name has not been mentioned in the lists of nomina conservanda or nomina rejicienda, so it must take its course under the rules of priority. Cassini subsequently, Dict. Sci. Nat. xxxvii. 259 (1825), included in his genus a plant collected by Gaudichaud in Australia, namely *C. longifolia* Cass., a plant belonging to the *Astereae*. When the *Compositae* were treated by DeCandolle he unfortunately took this latter, Australian plant as the type of the genus, and referred the original South African species to a newly named genus, *Alciope* DC. Prod. v. 210 (1836). This was, of course, contrary to the clause of Article 45 of the International Rules, which reads: "If the genus contains a section or some other division which, judging by its name or its species, is the type or the origin of the group, the name is reserved for that part of it." DeCandolle's treatment has been generally accepted and perpetuated until the present day. It is true, Dr. Otto Kuntze noted the inconsistency and restored *Celmisia* to its original application, but he referred the Australian and New Zealand element of the complex to the genus *Aster*, a reduction not likely to be generally followed upon taxonomic grounds. The current International Rules appear to call for the following revision of the nomenclature in the genera concerned.

Celmisia tabularis (Thunb.), comb. nov. *Arnica tabularis* Thunb. Prod. Fl. Cap. 154 (1800). *Celmisia rotundifolia* Cass. Dict. Sci. Nat. vii. 357 (1817). *Ligularia tabularis* (Thunb.) Less. Syn. Comp. 390 (1832) by implication. *Alciope Tabularis* (Thunb.) DC. Prod. v. 210 (1836).

C. tomentosa (Burm. f.), comb. nov. *Conyza tomentosa* Burm. f. Prod. 26 (1768). *Arnica lanata* Thunb. Prod. Fl. Cap. 154 (1800). *Ligularia lanata* (Thunb.) Less. Syn. Comp. 390 (1832) by implication. *Alciope lanata* (Thunb.) DC. Prod. v. 210 (1836).

C. tomentosa, var. **grandis** (Thunb.), comb. nov. *Arnica grandis* Thunb. Prod. Fl. Cap. 154 (1800). *Alciope lanata β grandis* (Thunb.) DC. Prod. v. 210 (1836).

Elcismia, nom. nov. (Anogram.) *Celmisia* Cass. Dict. Sci. Nat. xxxvii. 259 (1825), and of most subsequent authors, not Cass. Dict. Sci. Nat. vii. 356 (1817). *Aster* § *Celmisiana* Ktze. in Post & Ktze. Lex. Gen. Phan. 49 (1904) — a name by its adjectival form inappropriate for use in generic rank.

E. Adamsii (Kirk), comb. nov. *Celmisia Adamsii* Kirk, Trans. N. Z. Inst. xxvii. 329 (1894).

E. Adamsii, var. **rugulosa** (Cheesem.), comb. nov. *Celmisia Adamsii*, var. *rugulosa* Cheesem. Man. N. Z. Fl. 313 (1906).

E. argentea (Kirk), comb. nov. *Celmisia sessiliflora*, var. *minor* Petrie, Trans. N. Z. Inst. xv. 359 (1882). *C. argentea* Kirk, Stud. Fl. N. Z. 292 (1899).

E. Armstrongii (Petrie), comb. nov. *Celmisia Armstrongii* Petrie, Trans. N. Z. Inst. xxvi. 269 (1894).

E. bellidioides (Hook. f.), comb. nov. *Celmisia bellidioides* Hook. f. Handb. N. Z. Fl. 135 (1864).

E. Brownii (F. R. Chapm.), comb. nov. *Celmisia Brownii* F. R. Chapm. Trans. N. Z. Inst. xxii. 444 (1890).

E. Campbellensis (F. R. Chapm.), comb. nov. *Celmisia Campbellensis* F. R. Chapm. Trans. N. Z. Inst. xxiii. 407 (1891). *C. Chapmani* Kirk, Gard. Chron. ix. 731, f. 146 (1891).

E. cordatifolia (J. Buchanan), comb. nov. *Celmisia cordatifolia* J. Buchanan, Trans. N. Z. Inst. xi. 427 (1879). *C. petiolata*, var. *cordatifolia* (J. Buchanan) Kirk, Stud. Fl. N. Z. 286 (1899).

E. coriacea (Forst. f.), comb. nov. *Aster coriaceus* Forst. f. Prod. 56 (1786). *Celmisia coriacea* (Forst. f.) Hook. f. Fl. Antarc. i. 36 (4 July, 1844), & Fl. N. Z. i. 121, t. 32 (1853); Raoul, Ann. Sci. Nat. ser. 3, ii. 119 (August, 1844).

E. Dallii (J. Buchanan), comb. nov. *Celmisia Dallii* J. Buchanan, Trans. N. Z. Inst. xiv. 355, t. 35 (1882).

E. densiflora (Hook. f.), comb. nov. *Celmisia densiflora* Hook. f. Handb. N. Z. Fl. i. 130 (1864).

E. discolor (Hook. f.), comb. nov. *Celmisia discolor* Hook. f. Fl. N. Z. i. 123 (1853).

E. dubia (Cheesem.), comb. nov. *Celmisia dubia* Cheesem. Man. N. Z. Fl. 308 (1906).

E. Gibbsii (Cheesem.), comb. nov. *Celmisia Gibbsii* Cheesem. Man. N. Z. Fl. 300 (1906).

E. glandulosa (Hook. f.) comb. nov. *Celmisia glandulosa* Hook. f. Fl. N. Z. i. 124 (1853).

E. Haastii (Hook. f.), comb. nov. *Celmisia Haastii* Hook. f. Handb. N. Z. Fl. 131 (1864).

E. Hectori (Hook. f.), comb. nov. *Celmisia Hectori* Hook. f. Handb. N. Z. Fl. 135 (1864).

E. hieraciifolia (Hook. f.), comb. nov. *Celmisia hieraciifolia* Hook. f. Fl. N. Z. i. 124, t. 34B (1853).

E. hieraciifolia, var. **oblonga** (Kirk), comb. nov. *Celmisia hieracifolia*, var. *oblonga* Kirk, Trans. N. Z. Inst. xxvii. 328 (1894).

E. holosericea (Forst. f.), comb. nov. *Aster holosericeus* Forst. f. Prod. 56 (1786). *Celmisia holosericea* (Forst. f.) Hook. f. Fl. Antarc. i. 36, (4 July, 1844); Raoul, Ann. Sci. Nat. ser. 3, ii. 119 (August, 1844).

E. incana (Hook. f.), comb. nov. *Celmisia incana* Hook. f. Fl. N. Z. i. 123 t. 34A (1853).

E. incana, var. **petiolata** (Kirk), comb. nov. *Celmisia incana*, var. *petiolata* Kirk, Stud. Fl. N. Z. 284 (1899).

E. laricifolia (Hook. f.), comb. nov. *Celmisia laricifolia* Hook. f. Fl. N. Z. ii. 331 (1855).

E. lateralis (J. Buchanan), comb. nov. *Celmisia lateralis* J. Buchanan, Trans. N. Z. Inst. iv. 226, t. 15 (1872).

E. lateralis, var. **villosa** (Cheesem.), comb. nov. *Celmisia lateralis*, var. *villosa* Cheesem. Man. N. Z. Fl. 302 (1906).

E. Lindsayi (Hook. f.), comb. nov. *Celmisia Lindsayi* Hook. f. Handb. N. Z. Fl. 132 (1864).

E. linearis (Armstr.), comb. nov. *Celmisia linearis* Armstr. Trans. N. Z. Inst. xiii. 337 (1881).

E. longifolia (Cass.), comb. nov. *Celmisia longifolia* Cass. Dict. Sci. Nat. xxxvii. 259 (1825).

E. longifolia, var. **alpina** (Kirk), comb. nov. *Celmisia longifolia*, var. *alpina* Kirk, Stud. Fl. N. Z. 289 (1899).

E. longifolia, var. **gracilenta** (Hook. f.), comb. nov. *Celmisia gracilenta* Hook. f. Fl. Antarc. i. 35 (1844). *C. longifolia*, f. *gracilenta* (Hook. f.) Kirk, Stud. Fl. N. Z. 289 (1899). *C. longifolia*, var. *gracilenta* (Hook. f.) Cheesem. Man. N. Z. Fl. 314 (1906).

E. longifolia, var. **major** (Kirk), comb. nov. *Celmisia gracilenta*, var. β. Hook. f. Fl. N. Z. i. 123 (1853). *C. longifolia*, ff. *major* & *asteliaefolia* Kirk, Stud. Fl. N. Z. 289 (1899).

E. longifolia, var. **graminifolia** (Hook. f.), comb. nov. *Celmisia graminifolia* Hook. f. Fl. Antarc. i. 35 (1844). *C. longifolia*,

f. *graminifolia* (Hook. f.) Kirk, Stud. Fl. N. Z. 289 (1899). *C. longifolia*, var. *graminifolia* (Hook. f.) Cheesem. Man. Fl. N. Z. 314 (1906).

E. Lyallii (Hook. f.), comb. nov. *Celmisia Lyallii* Hook. f. Handb. N. Z. Fl. 133 (1864).

E. Lyallii, var. **pseudo-Lyallii** (Cheesem.), comb. nov. *Celmisia Lyallii*, var. *pseudo-Lyallii* Cheesem. Man. N. Z. Fl. 312 (1906).

E. Mackaui (Raoul), comb. nov. *Celmisia Mackaui* Raoul, Choix Pl. Nouv. Zel. 19, t. 14 (1846).

E. Macmahoni (Kirk), comb. nov. *Celmisia Macmahoni* Kirk, Trans. N. Z. Inst. xxvii. 327 (1894).

E. Monroi (Hook. f.), comb. nov. *Celmisia Monroi* Hook. f. Handb. N. Z. Fl. 133 (1864).

E. parva (Kirk), comb. nov. *Celmisia parva* Kirk, Trans. N. Z. Inst. xxvii. 328 (1894).

E. petiolata (Hook. f.), comb. nov. *Celmisia petiolata* Hook. f. Handb. N. Z. Fl. 134 (1864).

E. petiolata, var. **membranacea** (Kirk), comb. nov. *Celmisia petiolata*, var. *membranacea* Kirk, Stud. Fl. N. Z. 286 (1899).

E. petiolata, var. **rigida** (Kirk), comb. nov. *Celmisia petiolata*, var. *rigida* Kirk, Stud. Fl. N. Z. 286 (1899).

E. Petriei (Cheesem.), comb. nov. *Celmisia Petriei* Cheesem. Man. N. Z. Fl. 311 (1906).

E. prorepens (Petrie), comb. nov. *Celmisia prorepens* Petrie, Trans. N. Z. Inst. xix. 326 (1887).

E. ramulosa (Hook. f.), comb. nov. *Celmisia ramulosa* Hook. f. Handb. N. Z. Fl. 733 (1864).

E. rupestris (Cheesem.), comb. nov. *Celmisia rupestris* Cheesem. Trans. N. Z. Inst. xvi. 409 (1884).

E. Rutlandii (Kirk), comb. nov. *Celmisia Rutlandii* Kirk, Trans. N. Z. Inst. xxvii. 329 (1894).

E. sessiliflora (Hook. f.), comb. nov. *Celmisia sessiliflora* Hook. f. Handb. N. Z. Fl. 135 (1864).

E. Sinclairii (Hook. f.), comb. nov. *Celmisia Sinclairii* Hook. f. Handb. N. Z. Fl. 132 (1864).

E. spectabilis (Hook. f.), comb. nov. *Celmisia spectabilis* Hook. f. Fl. N. Z. i. 122, t. 33 (1853).

E. Traversii (Hook. f.), comb. nov. *Celmisia Traversii* Hook. f. Handb. N. Z. Fl. 134 (1864).

E. verbascifolia (Hook. f.), comb. nov. *Celmisia verbascifolia* Hook. f. Fl. N. Z. i. 121 (1853).

E. vernicosa (Hook. f.), comb. nov. *Celmisia vernicosa* Hook. f. Fl. Antarc. i. 34, tt. 26, 27 (1844).

E. viscosa (Hook. f.), comb. nov. *Celmisia viscosa* Hook. f. Handb. N. Z. Fl. 133 (1864).

E. Walkeri (Kirk), comb. nov. *Celmisia Walkeri* Kirk, Trans. N. Z. Inst. ix. 549 (1877).

Luina stricta (Greene), comb. nov. *Prenanthes stricta* Greene, Pittonia, ii. 21 (1889). *Luina Piperi* Robinson, Bot. Gaz. xvi. 43, t. 6 (1891). *Psacalium strictum* Greene, Pittonia, ii. 228 (1892). *Rainiera stricta* Greene, Pittonia, iii. 291 (1898). Some years ago the writer submitted material of this species to Dr. O. Hoffmann, author of the revision of the *Compositae* in Engler & Prantl's Natürliche Pflanzenfamilien. Replying to a request for his opinion as to the generic affinities of the plant, he wrote, under date of 20 September, 1897, "Nach Untersuchung des mir übersandten Materials halte ich Ihre Ansicht, dass die fragliche Pflanze in die Gattung Luina gehört für richtig, vorausgesetzt dass man *Luina* von *Cacalia* trennt. * * * * Doch würde ich für eine Vereinigung von *Luina* und *Cacalia* nicht stimmen." Having from my first investigation of the plant in question felt that it was a *Luina*, and having been confirmed in this view by the high authority of Dr. Hoffmann, I here associate with the generic name the earlier specific designation, according to the provisions of the International Rules.

Serratula deltoides (Ait.), comb. nov. *Onopordon deltoides* Ait. Hort. Kew. iii. 146 (1789). *Carduus atriplicifolius* Trev. Hort. Vratisl. 1820. *Silybum atriplicifolium* (Trev.) Fisch. Ind. Sem. Hort. Petrop. 1824. *Rhaponticum atriplicifolium* (Trev.) DC. Prod. vi. 663 (1837).

Onoseris onoseroides (HBK.), comb. nov. *Isotypus onoseroides* HBK. Nov. Gen. et Spec. iv. 12, t. 307 (1820). *Onoseris Isotypus* Benth. & Hook. f. Gen. Pl. ii. 487 (1873).

Chaetanthera cochlearifolia (Gray), comb. nov. *Oriastrum cochlearifolium* Gray, Proc. Am. Acad. v. 144 (1861).

Chaetanthera dioica (Remy), comb. nov. *Egania dioica* Remy in Gay, Fl. Chil. iii. 327, t. 36, f. 1 (1847); Wedd. Chlor. And. i. 32 (1855). *Oriastrum dioicum* (Remy) Reiche, Fl. Chil. iv. 357 (1904).

Chaetanthera Philippii, nom. nov. *Chondrochilus involucratus* Phil. Fl. Atac. 27, t. 3B (1860), not *Chaetanthera involucrata* Phil. Anal. Univ. Chil. xlvii. 6 (1894).

Chaetanthera splendens (Remy), comb. nov. *Elachia splendens* Remy in Gay, Fl. Chil. iii. 315 (1847). *Tylloma splendens* (Remy), Wedd. Chlor. And. i. 27, t. 8A (1855).

Trichocline reptans (Wedd.), comb. nov. *Bichenia reptans* Wedd. Chlor. And. 25, t. 8B (1855).

Gerbera gossypina (Royle), comb. nov. *Chaptalia gossypina* Royle, Ill. 18, 247, 251 (mere mentions, without characterization) & t. 57, f. 2, with floral details ("analyses") rendering the plate valid publication according to Article 37 of the International Rules. *Onoseris lanuginosa* Wall. Cat. no. 2929 (1828), nomen nudum. *Oreoseris lanuginosa* (Wall.) DC. Prod. vii. 17 ("1838"), citing Royle both by page and plate number; Deless. Ic. iv. 34 (citing both Royle and DC.), t. 76 ("1839"). It is impossible to see how the name *lanuginosa* can stand under the International Rules. Wallich's original publication of the name in 1828 is accompanied by no description. The publications of DeCandolle and Delessert must have been prepared at the same time and in collaboration, since they each cite the other by reference to page or plate, but it is significant that they both cite Royle's publication, a seemingly conclusive evidence that it must have been already in print. A manuscript note in the copy of the fourth volume of Delessert's Icones in the library of the Gray Herbarium states that it was received in December, 1840.

Gerbera maxima (D. Don), comb. nov. *Chaptalia maxima* D. Don, Prod. Fl. Nepal. 166 (1825). *Perdicium semiflosculare?* Ham. ex D. Don, l. c., not L. *Tussilago macrophylla* Wall. Cat. no. 2989 (1828). *Berniera nepalensis* DC. Prod. vii. 18 ("1838"). *Gerbera macrophylla* (Wall.) Benth. in Benth. & Hook. f. Gen. Pl. ii. 497 (1873), according to Hook. f. Fl. Brit. Ind. iii. 391 (1882). *Gerbera nepalensis* (DC.) Sch. Bip. Flora, xxvii. 780 (1844).

LEUCHERIA INTEGRIFOLIA (Phil.) Reiche, Fl. Chil. iv. 420 (1905), as *Leuceria*. This binomial was published by its author in a foot-note with the statement that he did not regard it as valid. Why authors should wish to publish names which they do not believe to be valid is a psychological mystery, which need not be discussed here. The point of interest in the present case lies in the fact that the discredited binomial would appear after all to be the legitimate designation of the plant in question. Reiche founded his new combination upon *Chabraea integrifolia* Phil. Anal. Univ. Santiago, xli. 744 (1872), but he states that *Leuceria integrifolia* (Phil.) [Reiche] cannot be accepted because of the existence of an earlier *Leuceria integrifolia* Phil. However, this earlier homonym does not appear to have been published and it seems probable that Reiche had in mind *Chabraea integrifolia* Phil. Linnaea, xxviii. 716 (1856), which on a later page of his work (430) Reiche includes in the synonymy of *Leuceria lithospermifolia*

(DC.) Reiche. It is obvious that the existence of the binomial *Chabraea integrifolia* Phil. (1856), especially if invalid, does not prevent the validity of a *Leucheria integrifolia* founded upon Philippi's quite different *Chabraea integrifolia* of 1872. In the synonymy of this species may be placed *Leuceria Hahnii* Franch. Miss. Sci. Cap. Horn, v. 349, t. 3 (1889). *L. fuegina* Phil. Anal. Univ. Santiago, lxxxvii. 98 (1894). It is not improbable that this may also have been the *Chabraea suaveolens, β integrifolia* Sch. Bip. Flora, xxxviii. 121 (1855), nomen nudum.

Leucheria suaveolens (Urv.), comb. nov. *Perdicium suaveolens* Urv. Fl. des Iles Malouines, 43 (1825); Mém. Soc. Linn. Paris, iv. 611 (1826). *Lasiorhiza ceterachifolia* & *L. viscosa* Cass. Dict. Sci. Nat. xliii. 80, 81 (1826). *Leuchaeria gossypina* Hook. & Arn. Comp. Bot. Mag. ii. 43 (1836). *Chabraea suaveolens* (Urv.) DC. Prod. vii. 59 (1838).

Perezia virens (D. Don) Hook. & Arn. Comp. Bot. Mag. i. 34 (1835). This species is referred by Reiche, Fl. Chil. iv. 445 (1905) to *P. Poeppigii* Less. Syn. Comp. 411 (1832). It is clear that the validity of *P. virens* must depend upon the date of its name-bringing synonym *Clarionea virens* D. Don, Trans. Linn. Soc. xvi. 208. It is true that the volume in which it was published bears the date 1833, but it is stated that Don's paper was read 1829 and there is every reason to suppose that the different papers of which the volume is composed were issued as printed and at quite different dates. Fortunately there is conclusive proof that Don's paper had reached print and issue before Lessing's publication, for Lessing cites Don's paper on pages 407, 408, 412, and elsewhere in his Synopsis, which should settle the matter of priority and lead to the re-instating of *P. virens* (D. Don) Hook. & Arn.

Trixis calcicola, spec. nov., fruticosa; ramis lignescentibus medullosis a cortice flavido-brunneo tectis foliosis costato-angulatis juventate latiuscule alatis; foliis alternis oblongis attenuato-acuminatis mucronato-denticulatis 1–1.2 dm. longis 2.3–3 cm. latis utrinque viridibus supra rugulosis puberulis subtus venosissimis tenuiter pubescentibus dense glanduloso-atomiferis basi angustatis et in alas latiusculas denticulatas decurrentibus; alis internodia aequantibus vel superantibus usque ad 5 mm. latis deorsum cuneatim angustatis; corymbis ovoideis subthyrsiformibus densis ca. 1 dm. diametro et minus altis; bracteolis involucri exterioris 5 elliptico-oblanceolatis 1.7 cm. longis 5 mm. latis tenuibus vix acutis basi angustatis extus glanduloso-puberulis; squamis involucri interioris 8 oblongo-linearibus

1.2 cm. longis ca. 2 mm. latis obtusiusculis; achaeniis 7.3 mm. longis subfusiformi-columnaribus griseis glanduloso-hispidulis; pappi setis laete albis 1.2 cm. longis tenuissimis levissime scabratis numerosis.— Limestone ledges, Iguala Cañon, near Iguala, Guerrero, Mexico, altitude 760 m., 28 December, 1906, *C. G. Pringle*, no. 13, 921 (type, in Gray Herb.). The broadly winged stems would seem to place this species near *T. pterocaulis* Robinson & Greenman and *T. alata* Don. The former, however, has the bractlets of the outer involucre shorter than the scales of the inner involucre, leaves subentire, etc., while in *T. alata* Don the bractlets of the outer involucre are ovate-lanceolate and acuminate. The long obscure *T. michuacana* LaLav. & Lex., which from the original description would appear to have some points in common and might well be found in the same region, is said to have a simple herbaceous stem and a thyrsiform inflorescence nearly a foot long.

Launaea picridioides (Webb.), l. c., comb. nov. *Rhabdotheca picridioides* Webb. in Hook. Nig. Fl. 146 (1849).

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I. SOME NEW OR UNRECORDED COMPOSITAE CHIEFLY OF NORTHEASTERN AMERICA.

M. L. FERNALD.

DURING the past decade the large collections accumulated at the Gray Herbarium of plants from various districts of Northeastern America have contained many species unlike those ordinarily recognized in the region. Among these are numerous members of difficult genera of the *Compositae* which have from year to year been held over for further field-observation or close study. In attempting to label this accumulated material in some of the genera it has been necessary to characterize some of the plants as new, while some species heretofore considered as restricted to Northwestern America have been found to have abundant representation in the Northeast. The novelties in such genera as have been recently worked over are discussed below.

SOLIDAGO HISPIDA Muhl., as it occurs in northern New England, is a tolerably uniform plant, characterized by its densely pilose stem, its leaves pubescent upon both surfaces and its virgate or paniculate inflorescence with the heads densely clustered in elongate or short racemes. In Newfoundland and eastern Canada the plant abounds but it there varies greatly and is represented not only by the typical *S. hispida* but by four well marked varieties. One of these, var. *lanata* (Hook.) Fernald, found in Newfoundland, the Gaspé Peninsula

of Quebec and northernmost Maine, as well as on the Saskatchewan Plains has been already characterized.[1] The others, which seem not to have been heretofore distinguished, are as follows: —

S. HISPIDA, var. **disjuncta**, n. var., caulibus gracilibus 0.7–2.5 dm. altis albido-tomentosis; foliis utrinque hispidulis, basilariis spathulato-oblanceolatis 1–2 cm. latis, caulinis 2–5 infra inflorescentiam basilariis similibus; panicula racemiformi subsimplici laxe cylindrica 3–15 cm. longa, pedicellis remotis 1–5-cephalis; involucro 5–6 mm. longo.

Stems slender, 0.7–2.5 dm. high, white-tomentose: leaves hispidulous on both surfaces; the basal spathulate-oblanceolate, 1–2 cm. wide; the cauline 2–5 below the inflorescence, similar to the basal: panicle racemiform, subsimple, loosely cylindric, 3–15 cm. long; pedicels remote, 1–5-headed: involucre 5–6 mm. long. — NEWFOUNDLAND: calcareous cliffs, Steady Brook Falls, near mouth of the Humber River, July 16, 1910, *Fernald, Wiegand & Kittredge,* no. 4071 (TYPE in Gray Herb.). QUEBEC: calcareous cliffs, altitude 900–1125 m., Table-top Mountain, August 7, 1906, *Fernald & Collins,* no. 775; Montmorency Falls, August 4, 1902, *J. R. Churchill.*

S. HISPIDA, var. **tonsa**, n. var., caulibus glabris vel sparse puberulis; foliis glabris vel glabratis vel subtus ad nervos pilosis margine eciliatis vel sparse ciliatis, basilariis oblanceolatis vel anguste obovatis 1–2.5 cm. latis plerumque subacutis, caulinis 7–20 infra inflorescentiam basilariis similibus gradatim minoribus, superioribus 1–5 cm. longis 2–8 mm. latis; panicula thyrsiformi densa; involucro 3–5 mm. longo.

Stems glabrous or sparingly puberulent: leaves glabrous, subglabrate, or pilose on the nerves beneath, the margin without cilia or sparingly ciliate; the basal oblanceolate or narrowly obovate, 1–2.5 cm. wide, mostly subacute; the cauline 7–20 below the inflorescence, similar to the basal, gradually smaller; the upper 1–5 cm. long, 2–8 mm. wide: panicle thyrsiform, dense: involucre 3–5 mm. long.— NEWFOUNDLAND: serpentine tableland (altitude 550 m.) and slopes of Blomidon, August 21, 1910, *Fernald & Wiegand,* nos. 4074, 4075 (TYPE in Gray Herb.), 4076, 4077; heath on diorite tableland, alt. 380 m., Lookout Mountain, Bonne Bay, August 26, 1910, *Fernald, Wiegand & Kittredge,* no. 4079; barrens at base of serpentine tableland, Bonne Bay, August 27, 1910, *Fernald, Wiegand & Kittredge,* no. 4080. QUEBEC: Jupiter River, Anticosti, July 20, 1883, *J. Macoun;* Rivière du Loup, August, 1914, *Bro. Victorin,* no. 588. NEW BRUNSWICK: Nepisiguit Falls, August, 1873, *J. Fowler.*

In its most pronounced form closely simulating the southern *S. erecta* Pursh, but distinguished by its deep orange-yellow rays and by the greener involucre with fewer series of bracts.

S. HISPIDA, var. **arnoglossa**, n. var., caulibus crassis puberulis 2–3

[1] Hook. Fl. Bor.-Am. ii. 4 (1834); Fernald, RHODORA, x. 87 (1908).

dm. altis; foliis coriaceis supra glabris subtus sparse hirtellis, basilariis oblongo-obovatis 2.5–6 cm. latis apice rotundatis margine crenatis, caulinis 5–9 infra inflorescentiam basilariis similibus, superioribus 5–8 cm. longis 2–2.5 cm. latis; panicula thyrsiformi densa, racemis inferioribus foliis majus suffultis: involucro 4–5 mm. longo.

Stems stout, puberulent, 2–3 dm. high: leaves coriaceous, glabrous above, sparingly hirtellous beneath; the basal oblong-obovate, 2.5–6 cm. wide, rounded at apex, the margin crenate; cauline 5–9 below the inflorescence, similar to the basal; the upper 5–8 cm. long, 2–2.5 cm. wide: panicle thyrsiform, dense, the lower racemes subtended by large leaves: involucre 4–5 mm. long.— NEWFOUNDLAND: sea-cliffs, Apsey Beach, Bay of Islands, August 10, 1895, *Waghorne* (TYPE in Gray Herb.); open woods, Meadows, Bay of Islands, September 3, 1896, *Waghorne*. Fernald & Wiegand's no. 4078 from Bonne Bay is intermediate between vars. *arnoglossa* and *fallax*.

SOLIDAGO **chlorolepis**, n. sp., caulibus caespitosis gracilibus erectis vel decumbentibus 1–3 dm. altis glabris vel sparse puberulis; foliis coriaceis utrinque glabris, basilariis rosulatis spathulato-oblanceolatis apice rotundatis vel subtruncatis crenato-serratisque basi cuneato-petiolatis 2–6 cm. longis 0.6–1.3 cm. latis, caulinis remotis 3–8 infra inflorescentiam basilariis similibus; panicula racemiformi subsimplici laxe cylindrica 3.5–20 cm. longa 1.5–2 cm. diametro; pedicellis remotis monocephalis vel 2–4-cephalis valde adscendentibus 1–1.5 cm. longis hirtellis viscidis, inferioribus foliis lineari-oblanceolatis suffultis; involucro hemisphaerico 3–4 mm. alto viscido; bracteis 4–5-seriatis exterioribus crassis lanceolatis viridibus margine stramineis, interioribus stramineis apice viridibus; ligulis 15–20 circa 2 mm. longis, 0.7 mm. latis; achaeniis hispidis.

Stems caespitose, slender, erect or decumbent, 1–3 dm. high, glabrous or sparsely puberulent: leaves coriaceous, glabrous on both sides; the basal rosulate, spatulate-oblanceolate, rounded or subtruncate and crenate-serrate at apex, cuneate-petiolate at base, 2–6 cm. long, 0.6–1.3 cm. wide; cauline remote, 3–8 below the inflorescence, similar to the basal: panicle racemiform, subsimple, loosely cylindric, 3.5–20 cm. long, 1.5–2 cm. in diameter; pedicels remote, monocephalous or 2–4-headed, strongly ascending, 1–1.5 cm. long, hirtellous and viscid, the lower subtended by linear-oblanceolate leaves: involucre hemispherical, 3–4 mm. high, viscid: the bracts 4–5-seriate; the outer thick, lanceolate, green; the median narrowly oblong, obtuse, green with stramineous margin; the inner stramineous with green tip: ligules 15–20, about 2 mm. long, 0.7 mm. wide: achenes hispid.— QUEBEC: serpentine barrens and brook-ravines, headwaters of Ruisseau au Diable, altitude 700–1000 m., Mt. Albert, August 12, 1905, *Collins & Fernald*, no. 140; crevices and talus of serpentine, gulch north of Lac au Diable, Mt. Albert, July 25, 1906, *Collins & Fernald*, no. 750 (TYPE in Gray Herb.).

Originally distributed as *S. decumbens* Greene, but differing from that common Rocky Mountain species in the greener foliage, the lower cauline more rounded or subtruncate; in the more interrupted simpler inflorescence with long-pedicelled and smaller heads; in the shorter deep green outer bracts of the involucre; and in the shorter ligules.

SOLIDAGO MULTIRADIATA Ait., var. **arctica** (DC.), n. comb. *S. Virgaurea* L. *μ. arctica* DC. Prod. v. 339 (1836).

Typical *S. multiradiata* Ait. Hort. Kew. iii. 218 (1789), originally described from Labrador, is known from Hudson Strait to Newfoundland, the Gaspé Peninsula, Quebec, and Kewatin; also in Alaska (Cape Nome, etc.) and on Nunivak Island. It has the cauline leaves comparatively short and reduced below the inflorescence to small or at least not conspicuous bracts. The var. *arctica* originally described by De Candolle from Unalaska and from St. Lawrence Bay (Bering Strait), has the leaves much more elongate, the upper usually equalling or overtopping the compact inflorescence. This plant has been examined from the following stations which indicate that it is the more characteristic phase of the species in the Aleutian and adjacent Islands. UNALASKA: without locality (*Langsdorff, Mertens, Dall, Harrington*); Dutch Harbor (*Van Dyke*, nos. 22, 196); Glacier River (*Van Dyke*, no. 141): POPOFF ISLANDS: Shumagin Islands (*Harrington*): BERING STRAIT (*C. Wright*).

SOLIDAGO **mensalis**, n. sp., caule solitario 2–3 dm. alto glabro superne piloso; foliis tenuibus glabris ciliolatis supra perviridibus subtus pallidis reticulato-venosisque, basilariis anguste ellipticis longe petiolatis lamina 3–4.5 cm. longa 1–2 cm. lata acuta margine serrato-dentatis, caulinis 9–13 infra inflorescentiam cuneato-oblanceolatis breviter acuminatis, imis subpetiolatis supra mediam serrato-dentatis, mediis superioribusque sessilibus subintegris vel integris 1.5–6 cm. longis 4–12 mm. latis; inflorescentia racemiformi subsimplici laxa 3–9 cm. longa, pedicellis 1–2 cm. longis pilosis adscendentibus remote bracteolatis; involucro campanulato-hemisphaerico 7–10 mm. alto; bracteis 3–4-seriatis subaequalibus viridibus costa glutinosa, exterioribus perviridibus lanceolato-attenuatis ciliolatis, interioribus lineari-acuminatis margine pallidis; floribus circa 50, ligulis 15 circa 4 mm. longis; achaeniis maturis 4 mm. longis substrigosis.

Stem solitary, 2–3 dm. high, glabrous except for the pilose summit: leaves thin, glabrous, ciliolate, deep green above, pale and reticulate-veiny beneath; the basal narrowly elliptic, long-petioled, the lamina

3–4.5 cm. long, 1–2 cm. wide, acute, with serrate-dentate margin; cauline 9–13 below the inflorescence, cuneate-oblanceolate, short-acuminate; the lower subpetiolate, serrate-dentate above the middle, the median and upper sessile, subentire or entire, 1.5–6 cm. long; 4–12 mm. wide: inflorescence racemiform, subsimple, loose, 3–9 cm. long; pedicels 1–2 cm. long, pilose, ascending, remotely bracteolate: involucre campanulate-hemispherical, 7–10 mm. high: bracts 3–4-seriate, subequal, green, the midrib glutinous; outer very green, lance-attenuate, ciliolate; the inner linear, acuminate, with pale margin: flowers about 50; ligules 15, about 4 mm. long: mature achenes 4 mm. long, somewhat strigose.— QUEBEC: calcareous north-facing cliffs at 900–1125 m. altitude, Table-top Mountain, Gaspé County, August 7, 1906, *Fernald & Collins*, no. 778 (TYPE in Gray Herbarium).

In its thin ciliolate leaves pale and conspicuously reticulate-veiny beneath and in the texture of the involucral bracts very near *S. multiradiata* Ait., but that species has very elongate oblanceolate basal leaves and essentially entire lower and median cauline ones, and a strongly corymbiform dense inflorescence of smaller heads, the involucres 5–6 mm. high and with less attenuate bracts.

SOLIDAGO **Klughii**, n. sp., glaberrima; caule gracile stricto 6 dm. alto maculato; foliis rigidis anguste linearibus subulato-attenuatis, imis in petiolum marginatum longe attenuatis, mediis 4–10 cm. longis 2–3 mm. latis; panicula virgata 1 dm. longa 1.5 cm. diametro; involucro 3–4 mm. longo; bracteis 3-seriatis, exterioribus mediisque lanceolatis acutis crassis costa viridi glutinosa, interioribus linearibus obtusis tenuibus stramineis ciliatis; ligulis 8–10.

Very smooth: stem slender, strict, 6 dm. high, mottled: leaves rigid, narrowly linear, subulate-attenuate; the lower narrowed into a long margined petiole; the median 4–10 cm. long, 2–3 mm. wide: panicle virgate, 1 dm. long, 1.5 cm. in diameter: involucre 3–4 mm. long: bracts 3-seriate, the exterior and median lanceolate, acute, thick, with green glutinous midrib; the interior linear, obtuse, thin, stramineous, ciliate: ligules 8–10.— ONTARIO: Oliphant, Bruce County, August 14, 1905, *A. B. Klugh*, no. 3 (TYPE in Gray Herb.).

A remarkable species, closely simulating the heretofore unique and very rare *S. Guiradonis* Gray of Fresno County, California. In habit, foliage and glutinous outer bracts of the involucre the two are inseparable; but *S. Guiradonis* has only two series of bracts, these all attenuate thick and glutinous, while *S. Klughii* has a third inner series of thin scarious obtuse bracts. *S. Klughii* is also notable as an addition to the flora of the Bruce Peninsula, long famous for its unique or isolated species.

Solidago humilis Pursh. In 1908 the writer [1] pointed out that the type of *S. humilis* Pursh [2] is a Newfoundland plant in the Banksian Herbarium, which is quite unlike the species (*S. racemosa* Greene) with which it was long identified. In the discussion of *S. humilis* seven years ago the exact identity of Pursh's species was left unsettled, but the statement made that it was either *S. uliginosa* Nutt. or *S. uniligulata* (DC.) Porter. At the same time it was pointed out that, as soon as its exact application should be determined, the name *S. humilis* Pursh must be taken up for one or the other of the two later species; and that those authors who had set aside the name *S. humilis* Pursh (1814) on account of a supposed earlier "*S. humilis*" of Miller (1768) could not have verified their references, for Miller had published, not "*S. humilis*" but *S. humilius*,[3] a name in the comparative degree (neuter) and certainly not the same name as *S. humilis*.

The recent collections from Newfoundland, Gaspé and the Labrador Peninsula have brought in a large number of sheets of *Solidago uliginosa* Nutt. Journ. Acad. Philad. vii. 101 (1834) and there is no question that the type of *S. humilis* Pursh is a small northern specimen of this species. It is perfectly matched in stature, habit, foliage, and even in the elongate leafy bract at the base of the slender interrupted thyrsus by such specimens as Spreadborough's no. 14324 from the Ungava River, Robinson & Schrenk's no. 210 from the Exploits River in Newfoundland, Fernald & Wiegand's no. 4098 from the shores of Ingornachoix Bay in Newfoundland, and Fernald & Collins's no. 768 from Table-top Mountain, Quebec. There is, then, no question that *S. humilis* Pursh (1814) is *S. uliginosa* Nutt. (1834). Although varying greatly in stature and in the size of the inflorescence *S. humilis* has the cauline leaves bluntly acuminate or at most acute, the rhachis and branches of the thyrsus at most short-hirtellous and the bracts of the involucre obtuse. About the ponds of the East Branch of the Humber in Newfoundland occurs a plant like *S. humilis* in habit and inflorescence but so far departing from it in details as to merit separation as

S. humilis Pursh, var. **peracuta**, n. var., foliis caulinis serratis apice subulato-attenuatis; ramis hirsutis, pilis 0.5–1 mm. longis; involucri bracteis attenuatis.

Cauline leaves serrate, the apex subulate-attenuate; branches

[1] Rhodora, x. 88–90 (1908).
[2] Pursh Fl. 543 (1814).
[3] Mill. Dict. ed. viii. no. 16 (1768).

hirsute with hairs 0.5–1 mm. long: bracts of the involucre attenuate.—NEWFOUNDLAND: open rocky woods, Middle Birchy Pond, East Branch of the Humber, July 13, 1910, *Fernald & Wiegand*, no. 4097 (TYPE in Gray Herb.).

SOLIDAGO UNILIGULATA (DC.) Porter, var. **levipes**, n. var., ramis paniculae pedicellisque glabris vel glabratis glutinosisque.

Branches of the panicle and pedicels glabrous or glabrate and glutinous.—NEW YORK: Penn Yan, *Sartwell* (TYPE in Gray Herb.); Bergen Swamp, 1880, *C. H. Peck*. ONTARIO: Pt. Edward, River St. Clair, September 14, 1884, *J. Macoun*.

In typical *S. uniligulata* as it grows in the bogs from Newfoundland to New Jersey the branches or the pedicels are conspicuously hirtellous. This typical form of the species occasionally extends inland to the Great Lake Region but the plant above described seems to be an extreme confined to western New York and Ontario.

SOLIDAGO ELLIOTTII T. & G., var. **divaricata**, n. var., caule 4–5 dm. alto sparse villoso; foliis confertis ellipticis 3–6 cm. longis 1.5–2 cm. latis subtus ad nervos sparse setosis, margine grosse crenato-serratis; panicula foliosa 1–1.5 dm. longa 1–1.3 dm. lata, ramis divaricatis apice recurvatis valde secundis bracteolatisque foliis amplis suffultis.

Stem 4–5 dm. high, sparingly villous: leaves crowded, elliptic, 3–6 cm. long, 1.5–2 cm. broad, sparingly setose on the nerves beneath; the margin coarsely crenate-serrate: panicle leafy, 1–1.5 dm. long, 1–1.3 dm. broad; the branches divaricate, recurved at apex, conspicuously secund and bracteolate, subtended by ample leaves.—RHODE ISLAND: meadow northeast of Fresh Pond, Block Island, September 15, 1913, *Fernald, Long & Torrey*, no. 10,543 (TYPE in Gray Herb.).

Very strongly simulating *S. rugosa*, var. *villosa* in its leafy inflorescence with widely divergent or recurved branches; but with the involucre (5–5.5 mm. long) exactly as in *S. Elliottii*. In the slightly villous stem and the sparingly setose nerves of the leaves also suggesting *S. rugosa*, which, however, has much smaller heads.

SOLIDAGO RUGOSA Mill., var. **aspera** (Ait.), n. comb. *S. aspera* Ait. Hort. Kew. iii. 212 (1789).

Field-experience through several seasons with this plant has convinced the writer that it is better treated as an extreme variation of *S. rugosa* than as a distinct species. Var. *aspera* is more abundant southward than is typical *S. rugosa* and commonly prefers drier habitats.

Solidago lepida DC. In the region including Newfoundland and southern Labrador, the Gaspé Peninsula and northern New Brunswick and northern Maine, *Solidago canadensis* L. is less common than farther south, and *S. serotina* Ait. is unknown. Here their places are occupied chiefly by a very common goldenrod, in foliage and size of heads somewhat intermediate between those two species, but with the branches of the panicle strongly ascending or but slightly secund. In this northeastern area, centering about the Gulf of St. Lawrence, this common goldenrod, with heads much larger (involucre 3–5 mm. high) than in *S. canadensis* (involucre 2–2.8 mm. high) [1] but with the stems puberulent or minutely pilose much as in that species, is quite as variable as others of the genus, but it is possible to recognize four somewhat distinct trends of the species.

About the Straits of Belle Isle and in some parts of eastern Newfoundland the plant has broadly lanceolate to oblong coarsely serrate leaves and a short compact thyrsus which is almost overtopped by the upper leaves. This plant is a good match for authentic Alaskan material and in foliage is closely matched by a fragment of the type of *Solidago lepida* DC. Prod. v. 339 (1836).

On the limestone detritus of Percé, in Gaspé County, Quebec, occurs a plant strongly resembling *S. lepida*, but with the leaves very densely cinereous-pilose. This cinereous extreme of the series has, so far as the writer can determine, received no name.

A third variant is a plant with elongate-lanceolate smoothish leaves and elongate or somewhat rhombic scarcely leafy thyrsus. This plant, abounding on the gravels of the River Ste. Anne des Monts in Gaspé County, Quebec, seems quite inseparable from extreme specimens of the northwestern *S. elongata* Nutt. Trans. Am. Phil. Soc. vii. 327 (1840).

But by far the commonest trend of the species in the Northeast is a tall plant which is clearly a very large extreme of *S. elongata* with an ample panicle. Often as large but never as secund as in *S. serotina*, but with large leaves running well into the inflorescence much as in *S. rugosa*, var. *villosa* (Pursh) Fernald,[2] this variety, in foliage and in the long branches of the inflorescence, passes directly into *S. elongata* and in the leafy character of its panicle clearly connects with the most characteristic *S. lepida*. It occurs in good development, not only in

[1] See Fernald, Rhodora, x. 92 (1908).
[2] Fernald, Rhodora, x. 91 (1908).

the Northeast — from Newfoundland and Gaspé to Montmorenci County, Quebec and Aroostook County, Maine — but is found somewhat generally across the continent: in Ontario, Michigan, Saskatchewan, British Columbia, Montana, Wyoming, Utah, &c., where it has passed variously as *S. canadensis* L., *S. serotina* Ait., *S. serotina*, var. *salebrosa* Piper, and *S. elongata* Nutt.

In all their essential characters: pubescence of stem, foliage, ascending or barely recurved branches of the inflorescence, and in the texture and size of the involucre, these plants are all obviously of one species for which the earliest name is *S. lepida* DC.; but as varieties they are fairly marked and are here proposed as

S. LEPIDA DC., var. **molina**, n. var., caule 3.5–4.5 dm. alto dense cinereo-tomentuloso subviscoso; foliis confertis oblongo-lanceolatis grosse serratis supra scabris subtus dense cinereo-pilosis subviscosis; panicula erecta terminali rhomboideo 5–9 cm. longo.

Stem 3.5–4.5 dm. high, densely cinereous-tomentulose, somewhat viscid: leaves crowded, oblong-lanceolate, coarsely serrate, scabrous above, densely cinereous-pilose and somewhat viscid beneath: panicle erect, terminal, rhomboid, 5–9 cm. long.— QUEBEC: limestone detritus of Cap Barré, Percé, August 16, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.); gravelly slopes, Les Murailles, Percé, August 17, 1904, *Collins, Fernald & Pease* (*Pease*, no. 6220).

Cited in the 7th edition of Gray's *Manual* under *S. canadensis*, var. *gilvocanescens* Rydberg, but on account of its larger involucre and dense upright panicle better placed with *S. lepida*.

S. LEPIDA, var. **elongata** (Nutt.), n. comb. *S. elongata* Nutt. Trans. Am. Phil. Soc. vii. 327 (1840).

S. LEPIDA, var. **fallax**, n. var., caule 0.5–1.5 m. alto, supra minute piloso; foliis lanceolatis vel oblanceolatis 0.5–1.5 dm. longis argute serratis acuminatis supra glabris vel plus minusve scabris, subtus ad nervos scabris; panicula erecta subcorymbiformi vel pyramidali 1–3 dm. longa, 0.7–2 dm. lata, ramis adscendentibus vix vel paulo recurvatis inferioribus foliis elongatis suffultis; involucro 3–5 mm. longo, bracteis circa 3-seriatis lineari-lanceolatis tenuibus.

Stem 0.5–1.5 m. high, minutely pilose above: leaves lanceolate or oblanceolate, 0.5–1.5 dm. long, coarsely sharp-serrate, acuminate, glabrous or more or less scabrous above, scabrous on the nerves beneath: panicle erect, somewhat corymbiform or pyramidal, 1–3 dm. long, 0.7–2 dm. wide; the branches ascending, not at all or only slightly recurved, the lower subtended by elongate leaves: involucre 3–5 mm. long; bracts about 3-seriate, linear-lanceolate, thin.— Newfoundland to British Columbia, south to northern New Brunswick, northern Maine, northern Michigan, Utah and Washington.

The following specimens are characteristic. NEWFOUNDLAND: rocky soil, base of cliff, near Topsail, Conception Bay, August 12–19, 1901, *Howe & Lang*, no. 1282; gravelly thicket, Harry's River, August 18, 1910, *Fernald & Wiegand*, no. 4108 (TYPE in Gray Herb.); damp thickets, Grand Falls, August 11, 12, & 14, 1911, *Fernald, Wiegand & Darlington*, nos. 6298, 6299, 6300. QUEBEC: gravel-beaches and bars, River Ste Anne des Monts, August 3–17, 1905, *Collins & Fernald;* alluvial woods at mouth of Bonaventure River, July 31, 1902, *Williams & Fernald*, August 4, 1904, *Collins, Fernald & Pease* (*Pease*, no. 5918); vicinity of Cap à l'Aigle, August, 1905, *J. Macoun*, nos. 68,376, 68,378; Ste Anne de Beaupré, August 30, 1905, *J. Macoun*, no. 68,375. NEW BRUNSWICK: border of woods, Four Falls, Victoria County, August 11, 1909, *Fernald*, no. 2232. MAINE: river-thicket, Fort Fairfield, August 15, 1901, *Robinson & Fernald.* ONTARIO: Onaman River, Thunder Bay District, 1912, *H. E. Pulling.* MICHIGAN: shaded ditches, Keewanaw County, October, 1887, *Farwell*, no. 491 (very pubescent). SASKATCHEWAN: *Bourgeau*, 1858. BRITISH COLUMBIA: flood plain of the Columbia at Beavermouth, August 18, 1905, *Shaw*, no. 1166. WYOMING: Snake River, August 13, 1899, *Nelson*, no. 6441. UTAH: Utah Valley, July, 1869, *Watson*, no. 562. WASHINGTON: Granville, July 18, 1902, *Conard*, no. 347; valley of Swauk River, 1913, *S. P. Sharples*, no. 238.

Passing by numerous transitions on the one hand to the more condensed typical *S. lepida*, on the other to var. *elongata* with its more elongate and more definitely terminal thyrsus. Often confused in the Herbarium with *S. serotina* Ait., which has the stems glabrous up to the inflorescence with its strongly secund branches, and the heads usually larger. In the East more often confounded with *S. canadensis* L. which has similar foliage and similarly pubescent stems, but very small heads (the involucre 2–2.8 mm. long) on strongly recurving branches. In its more pubescent extremes simulating the more southern *S. altissima* L., which has the very cinereous leaves thick and usually entire and the involucral bracts firmer and less attenuate.

SOLIDAGO **Bartramiana**, n. sp., caulibus caespitosis gracilibus glabris vel supra sparsissime pilosis 2–3.5 dm. altis; foliis uniformibus lanceolato-attenuatis triplinerviis tenuibus 3–6 cm. longis 4–8 mm. latis utrinque glabris vel subtus ad nervos scabris, margine integris vel obsolete serratis scabris; panicula erecta terminali thyrsiformi vel corymbiformi 3–12 cm. longa 2–7 cm. lata, ramis arcte adscendentibus inferioribus foliis elongatis suffultis; capitulis paucis plerumque longe pedicellatis, pedicellis 7–12 mm. longis setulosis minute bracteolatis; involucro 2.5–3 mm. longo, bracteis 1–2-seriatis 10–15 lineari-attenuatis glabris tenuibus viridescentibus; ligulis circa 10; achaeniis ma-

turis 1.5–2 mm. longis hispidis; pappo 1.5–2 mm. longo, setibus basi plerumque flexuosis.

Stems caespitose, slender, glabrous or above very sparsely pilose, 2–3.5 dm. high: leaves uniform, lance-attenuate, triple-nerved, thin, 3–6 cm. long, 4–8 mm. wide, glabrous on both surfaces or scabrous on the margin beneath, entire or obsoletely serrate, the margin scabrous: panicle erect, terminal, thyrsiform or corymbiform, 3–12 cm. long, 2–7 cm. wide; the branches strongly ascending, the lower subtended by elongate leaves: heads few, mostly long-pedicelled; the pedicels 7–12 mm. long, setulose and minutely bracteolate: involucre 2.5–3 mm. long; the bracts 1–2-seriate, 10–15, linear-attenuate, glabrous, thin, greenish: ligules about 10: mature achenes 1.5–2 mm. long, hispid: pappus 1.5–2 mm. long, the bristles usually flexuous at base.—NEWFOUNDLAND: ledges and talus, north bank of Exploits River below the falls, Grand Falls, July 22, 1911, *Fernald, Wiegand, Bartram & Darlington*, no. 6303 (TYPE in Gray Herb.).

Named for Edwin Bunting Bartram, President of the Philadelphia Botanical Club and worthy representative of a distinguished botanical name, who first detected the plant at its type-locality. *S. Bartramiana* in habit resembles *S. lepida* and its var. *fallax*, but is at once distinguished from all the varieties of *S. lepida* by its glabrous stems, long-pedicelled heads and almost uniseriate involucres. At Grand Falls *S. Bartramiana* was mature (with ripe fruit) on July 22, while at the same locality *S. lepida*, var. *fallax* was fully a month later, collected in young flowering condition the middle of August.

SOLIDAGO CANADENSIS L., var. **Hargeri**, n. var., caulibus villosis; foliis lanceolatis argute serratis supra scabris subtus cinereo-puberulis.

Stems villous: leaves lanceolate, sharply serrate, scabrous above, cinereous-puberulent beneath.—Valleys of the Deerfield and Housatonic Rivers, Massachusetts and Connecticut. MASSACHUSETTS: roadside, Florida, August 27, 1904, *Ralph Hoffmann*. CONNECTICUT: roadside near the Housatonic River, at Bennett's Bridge, Southbury, October 1, 1901, *E. B. Harger* (TYPE in Gray Herb.); dry soil near the Housatonic River, Oxford, August 15, 1910, *Harger*.

This plant, specially called to my attention by Mr. E. B. Harger, is frequent in the Housatonic Valley. It has the tiny heads, characteristic inflorescence, and "triple-nerved" leaves of *Solidago canadensis* L., but differs strikingly from the typical form of that species (which has the stems glabrous or merely a little pilose except near the inflorescence and the leaves at most pilose along the nerves beneath) in having the upper half or two-thirds of the stem villous and the leaves closely cinereous-puberulent beneath as in the large-headed *S.*

altissima L. In the pubescence of the stem the plant suggests *S. rugosa* but there the resemblance ceases, for Mr. Harger's plant has the definitely "triple-nerved" leaves of *S. canadensis*. In the cinereous-puberulent lower surfaces of the leaves it is suggestive of the common western *S. canadensis*, var. *gilvocanescens* Rydberg, which is found locally as far eastward as Vermont,[1] but that variety has the stems cinereous-pulverulent or at most puberulent. The plant of the Housatonic Valley, with villous stems, which Mr. Harger reports having seen at a number of stations in Connecticut, extends northward to the Deerfield Valley in Massachusetts, and it seems to be a distinct geographic variety.

SOLIDAGO GRAMINIFOLIA (L.) Salisb., var. **septentrionalis**, n. var., caule glabro vel subglabro; foliis perviridibus lanceolatis vel oblongo-lanceolatis nec attenuatis apice obtusiusculis glabris vel subtus ad nervos paulo setulosis; corymbo laxo ramis lateralibus valde elongatis; capitulis plerumque glomerulatis; pedicellis paulo setulosis; involucro 4–4.5 mm. alto, bracteis apice viridibus.

Stem glabrous or nearly so: leaves deep green, lanceolate or oblong-lanceolate, not attenuate, bluntish, glabrous or beneath a little setulose on the nerves: corymb loose, the lateral branches conspicuously elongate: heads mostly glomerulate: pedicels a little setulose: involucre 4–4.5 mm. high; bracts green at tip.— NEWFOUNDLAND: ledges, talus and gravel, north bank of Exploits River below the falls, Bishop Falls, July 28, 1911, *Fernald, Wiegand & Darlington*, no. 6305, and Grand Falls, August 12, 1911, no. 6306 (TYPE in Gray Herbarium); and gravelly railroad embankment, Grand Falls, August 14, 1911, no. 6307. QUEBEC: gravelly beach of St. John (or Douglastown) River, Gaspé County, August 23, 1904, *Collins, Fernald & Pease*.

The representative of the continental *S. graminifolia* in central Newfoundland and the Gaspé Peninsula, differing strikingly in foliage from the typical form of the species which has the narrower leaves long-attenuate to sharp tips and the corymb ordinarily much denser, with branches of more uniform length. In the outline of its leaves var. *septentrionalis* suggests the western var. **camporum** (Greene), n. comb., = *Euthamia camporum* Greene, Pittonia, v. 74 (1902); but that plant has the firmer leaves light green, the corymb comparatively dense and the involucral bracts pale throughout. In the green-tipped involucral bracts var. *septentrionalis* suggests var. **polycephala** (Fernald), n. comb., = *S. polycephala* Fernald, RHODORA, x. 93 (1908); *Euthamia floribunda* Greene, Pittonia, v. 74 (1902), not *S. floribunda*

[1] **Proctor, Vermont, *W. W. Eggleston* in Gray Herb.**

Phil. Anal. Univ. Chil. lxxxvii. 430 (1894). But this apparently local plant of New Jersey, eastern Pennsylvania and Maryland has the leaves long-attenuate, the pedicels copiously setulose, and the involucres only 3–3.5 mm. high, and seems to be a small-headed extreme nearest allied to var. *Nuttallii* (Greene) Fernald.

ASTER **johannensis**, n. sp., caule solitario gracile 4 dm. alto glabro; foliis oblanceolatis utroque attenuatis acuminatis basi subcordatis supra scabris subtus glabris margine remote serratis, mediis 6–8 cm. longis 1–1.2 cm. latis: pedicellis paucis (3–5) monocephalis 5–9 cm. longis 3–5 foliis parvis instructis involucro hemisphaerico 7–8 mm. alto, bracteis valde 2–3-seriatis herbaceis anguste linearibus 0.7–1 mm. latis apice subulatis; ligulis violaceis 1–1.3 cm. longis anguste linearibus; pappi setis 1-seriatis barbellulatis; achaeniis setosis.

Stem solitary, slender, 4 dm. high, glabrous: leaves oblanceolate, narrowed to both ends, acuminate, at base subcordate, scabrous above, glabrous beneath, the margin remotely serrate; the median 6–8 cm. long, 1–1.2 cm. wide: pedicels few (3–5) monocephalous, 5–9 cm. long, provided with 3–5 small leaves: involucre hemispherical, 7–8 mm. high; the bracts obviously 2–3-seriate, herbaceous, narrowly linear, 0.7–1 mm. wide, subulate at apex: ligules violet, 1–1.3 cm. long, narrowly linear: pappus-bristles 1-seriate, minutely barbellate: achenes setose.—QUEBEC: near Ouatchouan Falls, Lake St. John, August 19, 1904, *W. F. Wight*, no. 228 (TYPE in Gray Herb.).

Related to *A. junceus* Ait., but with larger heads, much more herbaceous but subulate-tipped involucral bracts, and broader coarsely serrate leaves. In its involucre exactly matching the western *A. Fremonti* Gray, but clearly distinct in its nearly uniform and serrate cauline leaves.

ASTER FOLIACEUS Lindl. In extreme eastern British America and northern New England the difficulties of clearly distinguishing the large-headed Asters of the section *Vulgares* (*A. novi-belgii* L., *A. longifolius* Lam., etc.) are further complicated by the abundance of a plant which in some characters differs from the ordinarily recognized eastern Asters. This heretofore little recognized eastern plant abounds in the river-valleys and on the damp mountain slopes of Newfoundland, southern Labrador, and eastern Quebec, extending westward to Portneuf County, Quebec and southward to northern Maine and northern New Hampshire. Its chief characters separating it from *A. novi-belgii* and *A. longifolius* are its very few large heads (involucre, excluding the enlarged outer bracts, 7–9 mm. high) chiefly

solitary on elongate pedicels which are naked or have 1 or 2 large dilated foliaceous bracts, and the essentially equal herbaceous or foliaceous involucral bracts. This plant with few long-pediceled heads is quite as variable as other species of its affinity, but in spite of its great variability it holds within the Hudsonian and Canadian area indicated the characters above defined and seems to be a pronounced trend such as is ordinarily considered a species in the genus *Aster*. The lower plants from alpine, subalpine and more northern habitats, with the "short monocephalous branches leafy about the heads,"[1] exactly coincide with authentic material from the original Alaskan localities of *A. foliaceus* Lindl.; while in some colonies the plants are an exact match for the original specimens of the Rocky and Cascade Mountain var. *frondeus* Gray, having the tall stems bearing "ample" leaves 1–1.5 dm. long and 2–3.5 cm. broad and many of the heads on long almost erect naked or nearly naked pedicels (often 5–15 cm. long). One of the eastern variants with foliage as in var. *frondeus* departs from that variety in its loosely arching pedicels; another strongly suggests the original Parry specimens (no. 417) from Colorado of var. *Parryi* Gray but differs from that little known plant in its more uniform foliage; another variant from the Gaspé coast with short crenate leaves and nearly uniformly leafy pedicels and outer involucral bracts, is an extreme departure from the others and simulates none of the western varieties known to the writer, while a fourth tendency, from western Newfoundland, has the unusually small heads mostly in pairs at the tips of the pedicels and the involucres almost lacking the enlarged foliaceous outer bracts.

These four undescribed northeastern varieties are so pronounced in their characters as to merit special designation as

A. FOLIACEUS Lindl., var. **arcuans**, n. var., caule 0.6–1 m. alto superne flexuoso; foliis tenuibus rhomboideo-lanceolatis acuminatis remote serratis, mediis 1–2 dm. longis 2–3.5 cm. latis; ramis pedicellisque laxe arcuato-adscendentibus, pedicellis 3–9 cm. longis monocephalis efoliatis vel remote cum 1–3 foliis oblongis instructis; involucro 8–10 mm. alto, bracteis lanceolatis herbaceis vel exterioribus foliaceis elongatisque.

Stem 0.6–1 m. high, flexuous above: leaves thin, rhombic-lanceolate, acuminate, remotely serrate; the median 1–2 dm. long, 2–3.5 cm. wide; branches and pedicels loosely arcuate-ascending; the pedicels 3–9 cm. long, monocephalous, naked or remotely provided with

[1] Gray, Syn. Fl. i., pt. 2, 193 (1884).

1–3 oblong leaves: involucre 8–10 mm. high, with the bracts lanceolate or with the outer foliaceous and elongate.— QUEBEC: alluvium of the St. John (or Douglastown) River, Gaspé County, August 23, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.); alluvial thickets and woods near the mouth of Dartmouth River, Gaspé County, August 26 & 27, 1904, *Collins, Fernald & Pease;* alluvium of York River, Gaspé County, July 29, 1905, *Williams, Collins & Fernald* (transitional to var. *frondeus*).

Resembling var. *frondeus* but differing in its more serrate leaves and in the much more spreading or arching branches and pedicels.

A. FOLIACEUS, var. **crenifolius**, n. var., caule 2.5–3.5 dm. alto; foliis crassis ellipticis basi apiceque angustatis subobtusis crenatis subtus pilosis, mediis 4.5–8 cm. longis 1.7–2.5 cm. latis; ramis pedicellisque subadscendentibus; pedicellis 1–3 cm. longis monocephalis foliis oblongis crenatis instructis; involucro 8–10 mm. alto, bracteis exterioribus foliaceis oblongis.

Stem 2.5–3.5 dm. high; leaves thick, elliptic, narrowed to base and apex, bluntish, crenate, pilose beneath; the median 4.5–8 cm. long, 1.7–2.5 cm. wide: branches and pedicels subascending; pedicels 1–3 cm. long, monocephalous, provided with oblong crenate leaves: involucre 8–10 mm. high, with the outer foliaceous bracts oblong.— QUEBEC: recent clearing near the mouth of Grand River, Gaspé County, August 11–15, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.).

In habit somewhat intermediate between the typical form of the species and var. *arcuans;* differing from both in the very crenate leaves and the uniform leafiness of the pedicels.

A. FOLIACEUS, var. **subpetiolatus**, n. var., caule 3–7 dm. alto glabro vel piloso; foliis patentibus vel subadscendentibus subcoriaciis glabris anguste rhomboideo-ovatis longe acuminatis basi angustatis remote serratis vel subintegris, mediis late subpetiolatis 1–1.5 dm. longis 2–4 cm. latis; ramis subadscendentibus; pedicellis plerumque 1.5–4 cm. longis monocephalis efoliatis vel apice cum foliis elongatis acuminatis instructis; involucro 8–10 mm. alto, bracteis lanceolato-attenuatis exterioribus plus minusve foliaceis.

Stem 3–7 dm. high, glabrous or pilose: leaves spreading or somewhat ascending, subcoriaceous, glabrous, narrowly rhombic-ovate, long-acuminate, narrowed at base, remotely serrate or subentire; the median broadly subpetioled, 1–1.5 dm. long, 2–4 cm. wide: branches subascending: pedicels mostly 1.5–4 cm. long, monocephalous, leafless or with elongate acuminate leaves at apex: involucre 8–10 mm. high, with lance-attenuate bracts, the outer more or less leafy.— QUEBEC: crests of sea-cliffs, Grand River, Gaspé County, August 11–15, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.); calcareous shingle at base of Cap Tourelle, and gravel by Ruisseau Patate,

Tourelle, August 19–21, 1905, *Collins & Fernald;* springy coniferous woods along "Low's Trail," at base of Table-top Mountain, August 14, 1906, *Collins & Fernald*, no. 738; banks of Becscie River, Anticosti, July 31, 1883, *J. Macoun*, no. 7.

Somewhat simulating *A. foliaceus*, var. *Parryi* Gray, but that plant, as represented by the original Parry material from Colorado, has the strongly ascending leaves smaller and rapidly decreasing to the summit, and the corymb much less leafy than in var. *subpetiolatus*, which in its extreme form suggests some forms of the smaller-headed *A. tardiflorus* L.

A. FOLIACEUS, var. **subgeminatus**, n. var., caule 2.5–5 cm. alto, glabro; foliis adscendentibus ellipticis vel anguste elliptico-ovatis longe acuminatis basi subpetiolaribus serratis, mediis 7–12 cm. longis 1.5–2.5 cm. latis; ramis pedicellisque perbrevibus arcte adscendentibus, pedicellis plerumque apice 2-cephalis; involucro 5–6 mm. alto, bracteis oblanceolatis chartaceis apice valde herbaceis.

Stem 2.5–5 cm. high, glabrous; leaves ascending, elliptic or narrowly elliptic-ovate, long-acuminate, with subpetiolar base, serrate; the median 7–12 cm. long, 1.5–2.5 cm. broad: branches and pedicels very short, strongly ascending, the pedicels usually terminated by 2 heads: involucre 5–6 mm. high; its bracts linear-oblanceolate, chartaceous, conspicuously herbaceous at tip.— NEWFOUNDLAND: damp bushy ravine in the limestone tableland, altitude 200–300 m., Table Mountain, Port-à-Port Bay, August 16, 1910, *Fernald, Wiegand & Kittredge*, no. 4126.

In foliage strongly resembling vars. *Parryi* and *subpetiolatus*, in habit like typical *A. foliaceus*, but distinguished from all the described varieties in its small usually paired heads and in the absence of the outer foliaceous bracts. In foliage also suggesting *A. tardiflorus* L. (unknown in Newfoundland) but readily distinguished by its broader and firmer involucral bracts and by the very few short erect pedicels. Material from the valley of Harry's River (no. 4120) strongly simulates var. *subgeminatus*, but has the involucre with more foliaceous outer bracts.

ASTER **anticostensis**, n. sp., caule solitario 4 dm. alto, subflexuoso glabro; foliis coriaceis lineari-lanceolatis utroque attenuatis basi subcordatis margine integris scabris, mediis 1.2–1.6 dm. longis 1 cm. latis; ramis arcte adscendentibus, pedicellis plerumque 2–5 cm. longis monocephalis efoliatis vel 1–2 foliis instructis: involucro hemisphaerico 1 cm. alto, bracteis valde imbricatis 3–4-seriatis, oblongis 1.5–2 mm. latis duris vel subcoriaceis flavescentibus apice subherbaceis; ligulis violaceis circa 1.5 cm. longis; pappo 1-seriato setis barbellatis; achaeniis setosis.

Stem solitary, 4 dm. high, subflexuous, glabrous: leaves coriaceous, linear-lanceolate, attenuate to both ends, the base subcordate, the margin entire scabrous; the median 1.2–1.6 dm. long, 1 cm. wide: branches strongly ascending; pedicels mostly 2–5 cm. long, 1-headed, leafless or with 1 or 2 leaves: involucre hemispherical, 1 cm. high; the bracts strongly imbricated in 3–4 series, oblong, 1.5–2 mm. wide, hard or somewhat leathery, yellowish, subherbaceous at tip: ligules violet, about 1.5 cm. long: pappus 1-seriate, the setae barbellate: achenes setose.— QUEBEC: river banks and grassy slopes, Jupiter River, Anticosti, July 20, 1880, *J. Macoun*, no. 6 (TYPE in Gray Herb., distributed as *A. paniculatus*).

A puzzling plant, in its monocephalous elongate pedicels simulating *A. foliaceus* but with very slender elongate leathery leaves like those of extreme *A. longifolius*. In the involucre, with its very broad firm bracts strongly imbricated, unlike any Eastern *Aster*, but somewhat suggesting some extreme specimens referred to the Northwestern *A. Douglasii* Lindl. In habit and involucre *A. anticostensis* strongly suggests the subarctic *A. spathulatus* Lindl., but that little-known plant has spatulate-oblanceolate leaves and the involucre less imbricated. When better known the two may be found to have closer affinities than are at present evident.

ASTER PUNICEUS L., var. **perlongus**, n. var., caule tenui hispido 4–5.5 dm. alto; foliis tenuibus sublucidis utrinque glabris lineari-lanceolatis vel -oblanceolatis acuminato-attenuatis basi valde cordato-amplexicaulibus minute serratis vel subintegris, mediis 1–2 dm. longis 1.2–2.2 cm. latis; ramis brevibus; involucri bracteis lineari-attenuatis laxis.

Stem slender, hispid, 4–5.5 dm. high: leaves thin, somewhat lustrous, glabrous on both sides, linear-lanceolate or -oblanceolate, acuminate-attenuate, strongly cordate-clasping at base, minutely serrate or subentire; the median 1–2 dm. long, 1.2–2.2 cm. wide: branches short: involucre with loose linear-attenuate bracts.— QUEBEC: springy spots in coniferous forest along "Low's Trail," altitude about 675 m., western base of Table-top Mountain, Gaspé County, August 14, 1906, *Fernald & Collins*, no. 737 (TYPE in Gray Herb.).

A very distinct extreme in its exceedingly slender and thin almost entire leaves.

ERIGERON HYSSOPIFOLIUS Michx., var. **villicaulis**, n. var., humilis 5–15 cm. altus vix caespitosus; caulibus simplicibus vel subsimplicibus pedicellisque dense villosis; foliis plus minusve villosis longe ciliatis.

Low, 5–15 cm. high, scarcely caespitose: the simple or subsimple stems and the pedicels densely villous: leaves more or less villous,

long-ciliate.— NEWFOUNDLAND: dry exposed ledges and shingle on the limestone tableland, altitude 200–300 m., Table Mountain, Port à Port Bay, July 16 & 17, 1914, *Fernald & St. John,* no. 10,866 (TYPE in Gray Herb.).

A very extreme variant of the common little *Erigeron hyssopifolius* of slaty and calcareous gravels and damp ledges in the Canadian and Hudsonian districts. Ordinarily (and in Michaux's type material) the taller branching and densely tufted stems and the pedicels are glabrous or only sparingly pilose and the otherwise glabrous leaves are at most sparingly short-ciliolate on the margin and midrib.

ARNICA **pulchella**, n. sp., rhizomate 2–4 cm. longo horizontali vel suberecto; caule solitario 1–1.8 dm. alto villoso, pilis albidis ad 2 mm. longis cum glandulis stipitatis minutis mixtis; foliis imis lanceolatis vel oblanceolatis 3–15 cm. longis 5–12 mm. latis acutiusculis apice calloso mutico basi in petiolos marginatos angustatis utrinque glandulosis laxe villosisque pilis 1–1.5 mm. longis, margine integris vel remote calloso-dentatis; foliis caulinis 1–2 jugis, inferioribus lanceolatis 2–4.5 cm. longis glandulosis villosisque apice calloso mutico, superioribus multo minoribus linearibus vel lanceolatis 1–3 cm. longis apice saepe linearibus attenuato scarioso; capite 1 pulchro 4.5 cm. diametro: involucro circa 1.5 cm. alto basi dense villoso supra glanduloso laxe villosoque; bracteis 8–10, anguste rhomboideis 3–3.5 mm. latis a medio ad apicem longe attenuatum tenuem angustatis; ligulis circa 10 luteis, lamina 1.3–1.5 cm. longa 7–8 mm. lata valde 7–9-nervata dorso strigosa apice argute 3–4-dentata, dentibus longioribus 3–5 mm. longis; achaeniis 6–7 mm. longis hirsutis; pappo circa 7 mm. longo albo, setibus barbellatis.

Rhizome 2–4 cm. long, horizontal or suberect: stem solitary, 1–1.8 dm. high, villous especially above; the white hairs up to 2 mm. long, mixed with minute stipitate glands: basal leaves lanceolate or oblanceolate, 3–15 cm. long, 5–12 mm. wide, acutish with a blunt callous tip, narrowed to margined petioles, glandular and loosely villous on both surfaces (the hairs 1–1.5 mm. long), margin entire or remotely callous-dentate: cauline leaves 1 or 2 pairs; the lower lanceolate, 2–4.5 cm. long, glandular and villous, with a blunt callous tip; the upper much reduced, linear or lanceolate, 1–3 cm. long, often with a linear-attenuate scarious appendage at tip: heads solitary, very handsome, 4.5 cm. broad; involucre about 1.5 cm. high, densely villous at base, glandular and loosely villous above; bracts 8–10, narrowly rhombic, 3–3.5 mm. broad, tapering from the middle to a long-attenuate thin tip: rays about 10, orange-yellow; the oblong-ovate blade 1.3–1.5 cm. long, 7–8 mm. broad, conspicuously 7–9-nerved, strigose on the back, the apex sharply 3–4-toothed, the longest teeth 3–5 mm. long: achenes 6–7 mm. long, hirsute: pappus about

7 mm. long, white; the bristles barbellate.— NEWFOUNDLAND: dry exposed ledges and shingle on the limestone tableland, altitude 200–300 m., Table Mountain, Port à Port Bay, July 16 & 17, 1914, *Fernald & St. John*, no. 10,874 (TYPE in Gray Herb.).

Intermediate between *Arnica alpina* (L.) Olin & Ladan of the Arctic and of northern Labrador and *A. tomentosa* J. M. Macoun of the Canadian Rocky Mountains. In *A. alpina*, which *A. pulchella* resembles in the shape and the tips of the leaves, the pubescence of the leaves and the lower half of the stem is very sparse and short, the involucre consists of 15–20 narrower less pubescent bracts; and the narrower rays are much less cleft, the blunter lobes being 1–2 mm. long. In the northwestern *A. tomentosa* the basal leaves are thicker than in *A. pulchella*, more prominently nerved and blunter, and covered with much longer pubescence; the upper leaves lack the slender apical appendage which is present in well developed *A. pulchella;* the pubescence of the stem and the involucre is very much longer and more copious (almost lanate); the bracts of the involucre are bluntish or merely acute; and the thicker and less prominently nerved rays have a longer pubescence on the back.

HIERACIUM CANADENSE Michx., var. **hirtirameum**, n. var., caule 2–8 dm. alto villoso-hirsuto vel infra glabrescente; foliis inferioribus ciliatis subtus plus minusve hirsutis; ramis pedicellisque gracilibus valde adscendentibus vel subfastigiatis copiose longe hirsutis, pilis 1.5–3 mm. longis cum glandulis minutis mixtis; involucro campanulato-hemisphaerico 5–10 mm. longo; bracteis circa 3-seriatis fuscis, exterioribus glanduloso-hirsutis.

Stems 2–8 dm. high, villous-hirsute or below glabrescent: lower leaves ciliate, more or less hirsute beneath: branches and pedicels slender, strongly ascending or somewhat fastigiate, copiously long-hirsute; the trichomes 1.5–3 mm. long, mixed with minute glands: involucre campanulate-hemispheric, 5–10 mm. long: bracts about 3-seriate, fuscous; the outer glandular-hirsute.— Newfoundland, eastern Quebec and northern Maine.— NEWFOUNDLAND: clearings and borders of thickets, Clarenville, August 19 & 20, 1911, *Fernald & Wiegand*, no. 6437; ledges, talus and gravel, north bank of Exploits River below the falls, Bishop Falls, July 28, 1911, *Fernald, Wiegand & Darlington*, no. 6433 (TYPE in Gray Herb.); dry, rocky clearing, Grand Falls, July 25, 1911, *Fernald, Wiegand, Bartram & Darlington*, no. 6432. QUEBEC: damp calcareous ledges and cliffs, between Baldé and Baie des Chaleurs, Bonaventure River, August 5–8, 1904, *Collins, Fernald & Pease;* damp ledges and cliffs, Little Cascapedia River, July 29 & 30, 1904, *Collins, Fernald & Pease;* ledgy banks of

Restigouche River, Matapedia, July 19, 1904, *Fernald.* Maine: shaded bank of St. John River, Allagash, August 11, 1893, *Fernald;* wooded bank of St. John River, Van Buren, September 18, 1900, *Fernald;* rocky island in Penobscot River, Upper Stillwater, September 18, 1899, *Fernald.*

A puzzling plant, in its characteristic development very different from the commonly larger *H. canadense,* but presenting numerous perplexing transitions. The variety seems to be more inclined than the species to an aberrant development (possibly pathological) in which the branches become shortened and crowded among the reduced upper leaves, the heads in these aberrant individuals becoming very numerous and tiny (with involucres only 2 or 3 mm. long).

II. SOME ANOMALOUS SPECIES AND VARIETIES OF BIDENS IN EASTERN NORTH AMERICA.

M. L. Fernald and Harold St. John.

In 1909 a peculiar *Bidens* was found on the tidal flats of Winnegance Creek, near the mouth of the Kennebec River in Maine, and at that time identified [1] with the northern *B. hyperborea* Greene, which was already known from James Bay and the estuaries of streams entering the Gulf of St. Lawrence. Subsequently the Maine plant has been found not only along Winnegance Creek, but on the tidal reaches of the Androscoggin at Topsham and Brunswick. Although in its erect outer involucral bracts it strongly simulates *B. hyperborea,* the plant of the lower Androscoggin and Kennebec shows many characters which indicate that its affinity is more nearly with *B. Eatoni* Fernald of the tidal flats of the Merrimac River. In *B. hyperborea* the heads are slenderly cylindric-campanulate; the chaff dark-striate; the achenes consistently 4-awned and many-striate, the inner nearly or quite 1 cm. long. In the plant of the lower Androscoggin and Kennebec the heads are turbinate-hemispherical, the chaff pale, often inconspicuously striate; the achenes consistently 2-awned, the inner 6 mm. long; and ordinarily the primary leaves more acuminate at tip

[1] Fernald & Wiegand, Rhodora, xii. 120, 144 (1910).

and with more numerous teeth. In its nearest relative, *B. Eatoni*, the leaves are all slender-petioled, the heads slender-cylindric, the inner involucre in well developed heads 1–1.5 cm. long, the chaff dark-striate, and the achenes usually 4-awned, the inner ones 7–9 mm. long and scarcely or only faintly striate; while in the plant from Maine the upper leaves are sessile, the inner involucre of well developed heads 5–8 mm. long, and the achenes are copiously channeled.

In its foliage and in the breadth of the larger heads the plant from the lower Androscoggin and Kennebec closely simulates extreme slender forms of *B. cernua* L., but that species has the nodding heads depressed-hemispherical in outline with a nearly flat base, the outer foliaceous bracts spreading, the chaff dark-striate, and the 4-awned achenes strongly 4-angled at summit and tuberculate on the angles. In the Maine plant, however, the erect heads have somewhat turbinate involucres, with erect outer foliaceous bracts, and the 2-awned achenes are flat and without tuberculate hairs.

Differing in all its essential characters from the three species which it most nearly resembles, the plant from the estuary of the Kennebec and Androscoggin Rivers seems to be another of the localized estuary species comparable with *B. bidentoides* (Nutt.) Britton, known only from the estuary of the Delaware, *B. Eatoni* Fernald, known only from the estuary of the Merrimac, and *B. hyperborea* Greene of the river-estuaries entering the Gulf of St. Lawrence and James Bay. The Maine plant we propose as

Bidens **colpophila**, n. sp., glaberrima subcarnosa; caule erecto 1–4 dm. alto simplice vel ramoso, ramis arcte adscendentibus; foliis oblanceolato-acuminatis; imis subpetiolatis; mediis superioribusque sessilibus 0.5–1 dm. longis 6–13 mm. latis remote serratis, serris utrinque 3–10; capitulis erectis; involucro turbinato-hemisphaerico, bracteis exterioribus foliaceis arcte adscendentibus glabris lineari-lanceolatis acutis vel subacutis 1.5–4 cm. longis, bracteis interioribus oblongis subacutis flavis badeo-striatis; paleis anguste oblongis flavis obsolete pallideque striatis; achaeniis anguste cuneatis planis utrinque valde circa 9-striatis retrorse setosis 2(rarissime 3)-aristatis, aristis 2.5–3 mm. longis retrorse barbatis, achaeniis exterioribus 5 mm. longis, interioribus 6 mm. longis.

Strictly glabrous and somewhat fleshy: stem erect, 1–4 dm. high, simple or branched; the branches strongly ascending: leaves oblanceolate; the lower subpetiolate; the middle and upper sessile, 0.5–1 dm. long, 6–13 mm. wide, remotely serrate, the teeth 3–10 on each side: heads erect: involucre turbinate-hemispherical; the outer foliaceous bracts strongly ascending, glabrous, linear-lanceolate, acute or sub-

acute, 1.5–4 cm. long; interior bracts oblong, subacute, yellow, brown-striate: pales narrowly oblong, yellow, obscurely pale-striate: achenes narrowly cuneate, flat, conspicuously about 9-striate on each side, retrorsely setose, 2(very rarely 3)-awned; the awns 2.5–3 mm. long, retrorsely barbed; outer achenes 5 mm. long, inner 6 mm. long.— MAINE: among sedges and rushes of a salt marsh, and at tide limit at edge of marsh, Winnegance Creek, Phippsburg, August 23, 1909, *Fernald & Wiegand* (*Fernald*, nos. 2248 & 2249 — TYPE in Herbarium of the New England Botanical Club); Cow Island, Topsham, August, 1910, *Kate Furbish;* bank of Androscoggin River, Brunswick, August 13, 1911, *C. H. Bissell.*

Bidens frondosa, as it ordinarily occurs, has the teeth of the leaves broadly deltoid, usually as broad at the base as the total length, and the foliaceous bracts of the involucre rarely twice as long as the inner bracts. Occasionally plants occur with more slender teeth or with longer outer bracts, but these two extreme tendencies are rarely if ever found in combination in the continental range of the species. In Newfoundland, however, the only indigenous colonies yet known of *B. frondosa* have the teeth of the leaves very narrowly lance-attenuate, and the foliaceous bracts 2.5–4 times as long as the inner involucre; and on Prince Edward Island and the Magdalen Islands this same combination of characters occurs in plants of the natural swales and marshes, indicating that in this area, at least, the species has departed sufficiently from its more general tendencies to merit the separation of a geographic variety,

B. FRONDOSA L., var. **stenodonta**, n. var., dentibus foliorum lanceolato-attenuatis, mediis 5–6 mm. longis; bracteis foliaceis involucri lanceolatis acuminatis plerumque 2.5–5 cm. longis.

Teeth of the leaves lance-attenuate; the median 5–6 mm. long: the foliaceous bracts of the involucre lanceolate, acuminate, usually 2.5–5 cm. long.— NEWFOUNDLAND, boggy open woods, Whitbourne, August 8, 1911, *Fernald & Wiegand*, no. 6375 (TYPE in Gray Herbarium); wet thickets, Norris Arm, August 21, 22, 1911, *Fernald & Wiegand*, no. 6376. QUEBEC: boggy margin of a brackish pond southwest of Étang du Nord village, Grindstone Island, Magdalen Islands, August 15, 1912, *Fernald, Long & St. John*, no. 8199. PRINCE EDWARD ISLAND: border of salt marsh, Bunbury, August 9, 1912, *Fernald, Long & St. John*, no. 8202.

In 1913 attention was directed to a peculiar plant of the Magdalen Islands which was then identified with *Bidens tripartita* L. of Eurasia and of the Gaspé Peninsula of Quebec, and to a variety of the Magdalen

Island plant common upon Prince Edward Island and characterized by having upwardly barbellate awns. The latter was then proposed as *Bidens tripartita*, var. *heterodoxa* Fernald.[1]

Subsequent collections and a more detailed study of the plants of Prince Edward Island and the Magdalens show that, although strongly simulating *Bidens tripartita* in foliage and in the flat usually 2-awned achene, the plant of these islands differs from that characteristic European species in having much smaller and copiously pubescent achenes and in having the outer foliaceous bracts of the involucre glabrous or at most very remotely ciliate toward the base. In *B. tripartita*, on the other hand, the much larger achenes are strictly glabrous and the outer involucral bracts conspicuously ciliate to the tip. The plant from the Gulf of St. Lawrence in its outer involucral bracts closely resembles the more southern, normally 4-awned *B. connata* Muhl., and occasional specimens with three or four awns tend to strengthen this similarity. In *B. connata*, however, the midribs of the two faces of the achene become strongly thickened at summit, thus giving to the top of the achene an obviously 4-angled appearance; and the surfaces of the achene are ordinarily quite glabrous or at most remotely setulose. In the plant of the Magdalen Islands and Prince Edward Island the copiously pubescent achenes are quite as flat as in *B. tripartita* and *B. comosa* (Gray) Wiegand. For this reason we feel justified in considering the insular plant a distinct species which is related on the one hand to *B. tripartita* (which is definitely known in North America only from the Gaspé Peninsula), on the other to the common continental species, *B. connata*.

B. **heterodoxa** (Fernald), n. comb. *B. tripartita* L., var. *heterodoxa* Fernald, Rhodora, xv. 76 (1913). Caule tenui glabro 1.5–9 dm. alto; foliis simplicibus vel 3–5-partitis utrinque glabris, imis tenuiter petiolatis, lamina vel loba terminali lanceolata vel anguste ovata 2.5–12 cm. longa argute grosseque serrata; capitulis discoideis vel radiatis; involucri bracteis foliaceis 3–6 lineari-lanceolatis elongatis, basi glabris vel sparse ciliatis, bracteis interioribus oblongis obtusis stramineis atro-striatis 7–9 mm. longis; paleis linearibus 4-striatis; achaeniis planis strigosis 2–4-aristatis margine aristisque sursum barbellatis, marginalibus cuneatis 4.5 mm. longis 1.8 mm. latis cum aristis 1.5 mm. longis coronatis, interioribus 6–7 mm. longis vix 2 mm. latis aristas 2–3 mm. longas gerentibus.

The stem slender, glabrous 1.5–9 dm. high: leaves simple or 3–5-parted, glabrous on both surfaces; the lower slender-petioled; blade

[1] Rhodora, xv. 76 (1913).

or terminal lobe lanceolate or narrowly ovate, 2.5–12 cm. long, sharply and coarsely serrate: heads discoid or radiate: involucre with 3–6 linear-lanceolate elongate foliaceous bracts, glabrous at base or sparsely ciliate; interior bracts oblong, obtuse, straw-colored, black-striped, 7–9 mm. long: pales linear, 4-striped: achenes flat, strigose, 2–4-awned, the margin and awns upwardly barbellate; marginal cuneate, 4.5 mm. long, 1.8 mm. wide, with awns 1.5 mm. long; interior 6–7 mm. long, scarcely 2 mm. wide, the awns 2–3 mm. long.— Besides the stations originally cited the following may be noted. PRINCE EDWARD ISLAND: border of fresh pond (recently an arm of the sea) back of sand hills, Tracadie, August 22, 1914, *Fernald & St. John*, no. 11,210 (radiate form). QUEBEC: sandy sea strand at the Narrows, Alright Island, Magdalen Islands, August 21, 1912, *Fernald, Long & St. John*, no. 8317 (broad leaved form with 4 awns).

B. HETERODOXA, var. **orthodoxa**, n. var., aristis achaeniorum retrorse setosis.

Awns of the achene retrorsely barbed.— QUEBEC: shallow water near the margins of brackish ponds, southwest of Étang du Nord village, Grindstone Island, Magdalen Islands, August 15, 1912, *Fernald, Long & St. John*, no. 8203 (TYPE in Gray Herbarium); boggy margin of strand at the Narrows, Alright Island, August 21, 1912, *Fernald, Long & St. John*, no. 8204.

In characteristic *Bidens connata* Muhl. the blades of the middle cauline leaves or the terminal lobes of the divided leaves have 10–20 sharp serrations on each margin, and the outer foliaceous bracts of the involucre are linear or linear-oblanceolate and inconspicuous, usually not more than 2 mm. broad and but slightly exceeding the inner involucre. On Block Island occurs a characteristic extreme in which the primary leaves are coarsely and irregularly dentate with 5–10 teeth on each margin and with the outer foliaceous bracts as large as in *B. comosa* (Gray) Wiegand, usually oblanceolate, the larger 3–6 cm. long and 0.5–1.5 cm. broad. A plant quite identical with this Block Island extreme has been collected by Mr. E. F. Williams at Lake Massapoag in Sharon, Massachusetts, indicating that the plant is of somewhat wide distribution in southern New England. This extreme plant with achenes as in *B. connata*, but with foliage and involucre similar to those of *B. comosa* may be called

B. CONNATA Muhl., var. **fultior**, n. var., foliis primariis laminis vel lobis terminalibus grosse inaequaliterque dentatis, dentibus utrinque 5–10; involucri bracteis foliaceis oblanceolatis, majoribus 3–6 cm. longis 0.5–1.5 cm. latis; aristis achaeniorum 4–6.— MASSACHUSETTS: Lake Massapoag, Sharon, September 10, 1899, *E. F. Williams*. RHODE

ISLAND: sandy pond-margins, east of Dickens Point, Block Island, September 15, 1913, *Fernald, Long & Torrey*, no. 10,688 (TYPE in Gray Herbarium).

Bidens cernua L. as it occurs in eastern America is highly variable and especially so in its foliage. Besides the typical form of the species with elongate-lanceolate or linear-lanceolate leaves with many coarse serrations, we get the dwarf bog plant, var. *minima* (Huds.) DC., with tiny, spatulate or oblanceolate petioled leaves and usually solitary campanulate heads; and the very large varieties with broader copiously serrate leaves, varieties *elliptica* and *integra* of Wiegand. On the brackish sands of the Magdalen Islands and Prince Edward Island occurs a depressed or matted, freely branching plant with the heads and achenes and the hispid stems of *B. cernua*. The small, fleshy leaves, however, are mostly obtuse and with few and obscure dentations, and the outer fleshy bracts of the involucre are oblong or broadly oblanceolate and much exceeding the inner series. This little plant, though first noted in maritime sands, does not seem to be restricted to brackish habitats, for identical material has been collected on the sandy shore of a pond in Coös County, New Hampshire, and an old specimen of Gray's from western New York is probably not separable. This extreme variation may be called

B. CERNUA L., var. **oligodonta**, n. var., humilis plus minusve depressa ramosissima 0.5–2 dm. alta; caulibus glabris vel sparse hispidis; foliis crassis rhomboideis vel elliptico-oblanceolatis obtusis ad basim angustatis subintegris vel pauce dentatis, dentibus utrinque 1–5 obtusis, foliis primariis 2–5 cm. longis 0.5–1.5 cm. latis; capitulis hemisphaericis 0.5–1 cm. latis; bracteis foliaceis oblongis vel late oblanceolatis obtusis plerumque 1.5–2 cm. longis.— QUEBEC: peaty margin of a brackish pond southwest of Étang du Nord wharf, Grindstone Island, Magdalen Islands, August 22, 1912, *Fernald, Long & St. John*, no. 8208 (TYPE in Gray Herbarium). PRINCE EDWARD ISLAND: wet brackish sand, North Lake, Kings County, August 24, 1912, *Fernald, Long & St. John*, no. 8209. NEW HAMPSHIRE: sandy shore, Success Pond, Coös County, August 27, 1907, *A. S. Pease*, no. 10,738. NEW YORK: western section, *Gray*.

III. AN INSULAR VARIETY OF SOLIDAGO SEMPERVIRENS.

HAROLD ST. JOHN.

Our common Seaside Golden-rod, *Solidago sempervirens*, was described by Linnaeus in 1753.[1] His brief characterization applies well to the plant of our northern Atlantic coast, known by him to occur in Canada and New York. He mentioned the "corymbose-panicled flowers," and the "lanceolate, subfleshy, glabrous, but slightly scabrous-margined leaves." His sources of information were: Gron. virg. 97; Corn. canad. 168; Herm. flor. 26; Moris. hist. 3. p. 124. f. 7. t. 23. f. 15; Pluk. alm. 389. t. 235. f. 5.

Of these the work of Jaques Cornut is the earliest and his description and full-page plate are by far the clearest. As the greater part of the description by Linnaeus was drawn from Cornut, we can safely turn to this fuller definition for more points about the species which Linnaeus characterized under the new name *sempervirens*.

Cornut's plate shows several sparsely branched stems arising from the rootstock. The radical leaves are wanting, the cauline are subsessile, lanceolate, tapering equally to either end and gradually diminishing in size to the base of or into the inflorescence, which is a loose panicle.

If we turn to the dried specimens in the Gray Herbarium and that of the New England Botanical Club we find *Solidago sempervirens* well matching Cornut's plate from the shores of the Gulf of St. Lawrence and along the coast to New Jersey, and less commonly to Florida. Along the southern part of our coast, from New Jersey southward, *S. sempervirens* is usually displaced by *S. stricta* Ait. and its variety *angustifolia* (Ell.) Gray.

In the Botany of California[2] Gray credits *S. sempervirens* to the Pacific coast, characterizing it in these words: "Leaves rather fleshy, lanceolate, entire, the uppermost reduced to subulate bracts of the virgate and rather dense panicle,.... Salt marshes near San Francisco, *Bolander*. Near the southern boundary, 60 miles east of San Diego, *Palmer*. Appears to be the same as the Salt-Marsh

[1] L. Sp. Pl. ii. 878 (1753).
[2] Bot. Calif. i. 319 (1876).

Goldenrod of the whole Atlantic shore down to Mexico. It is a form with small heads (3 lines long), approaching *S. angustifolia* of Elliott."

The interpretation that the plant of the Pacific coast is *S. sempervirens* has now become traditional,[1] but the descriptions of the plant seem to tally exactly with that of *S. confinis* Gray.[2] This species is separated from *S. sempervirens* on the character, "rays small, not surpassing the disc flowers." In *S. confinis* as in *S. sempervirens* the cauline leaves are divergent, gradually diminishing upward, but the leaves of the former are much narrower, being linear or lance-linear in outline. In the discussion following the description of *S. confinis* Gray cites one of the records he had formerly given for *S. sempervirens* in California: "*S. sempervirens*, Gray, Bot. Calif. i. 319, as to coll. Palmer." The other sheet cited by Gray in the Botany of California: "*Solidago sempervirens* L. Marsh, San Francisco, California, *H. N. Bolander*, 2249, 1866/7," seems to be typical of the plants since described as *S. sempervirens* in Behr's, Greene's, and Jepson's works. This plant is also *S. confinis*. From this it appears that the presence of *S. sempervirens* on the Pacific coast of North America has yet to be demonstrated.

Among the numerous names reduced by Gray [3] to synonyms of *S. sempervirens* L. is *S. azorica* Hochst.[4] In its flower and fruit characters this plant of the Azores is inseparable from *S. sempervirens* L. but the cauline leaves, on the other hand, are strikingly different in outline. They are sessile, ovate or deltoid-lanceolate, broadest just above the base, and tapering gradually into the blunt, attenuate tip. This may be recognized as

SOLIDAGO SEMPERVIRENS L., var. **azorica** (Hochst.), n. comb. *S. azorica* Hochst. in Seubert, Fl. Azorica, 31, t. X (1844).

Contrasting with this the North American *S. sempervirens* has the cauline leaves linear to broadly lanceolate, widest near the middle and tapering equally to either end.

[1] Behr, Fl. Vicin. San Francisco, 85 (1888); Greene, Flora Franciscana, 373 (1897); and Jepson, Fl. W. and Middle Calif. 476 (1911).
[2] Gray, Syn. Fl. N. Am. i. pt. 2, 149 (1884).
[3] Gray, Proc. Am. Acad. xvi. 192 (1882).
[4] Hochst. in Seub. Fl. Azorica, 31, t. x (1844).

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Although furnishing by their bright flowers much of the late-summer coloring of open habitats in eastern and northern New England and the more northerly regions, the Eyebrights seem to have attracted little notice in American botany until the past two decades. Michaux collected the characteristic species (*Euphrasia canadensis*) of the region of the city of Quebec on July 21, 1792; but it appeared in his *Flora* without statement of locality and under the indefinite name *Euphrasia officinalis* L. Pursh treated the Michaux plant as *E. officinalis* and also recorded a Labrador plant which he supposed to be Willdenow's *E. latifolia*. Other early American botanists apparently did not know of the genus *Euphrasia* in America; or such rare specimens as reached herbaria were treated as *E. officinalis* or varieties of it.

The first record of a *Euphrasia* in the United States seems to have been by William Oakes, who in 1847 listed as *E. officinalis* the little alpine plant which has subsequently been named *E. Oakesii* and added the significant note: "Stem dwarf, simple; leaves roundish, with obtuse teeth; flowers very pale, and extremely minute. It is probably E. micrantha *Reichenbach*, Fl. Exc. p. 358. . . . In the alpine region of the White Mountains. 1844." [1] In the 1st edition of Gray's *Manual* Oakes's White Mountain plant appeared as *E. officinalis*, but with the

[1] Oakes in Hovey's Mag. xiii. 217, 218 (1847).

added note that it is "a dwarf variety, 1′–5′ high, with very small flowers."[1] In the 2nd edition, however, Dr. Gray augmented the statement by adding to the White Mountain record "L. Superior, and northward" and by stating that the American "variety" is "E. pusilla, *Godet, mss.*"[2] Godet seems, though, never to have published his *E. pusilla*, although in a letter to Gray, under date of March 1, 1854, he wrote: "Votre *Euphrasia officinalis alpina* (White Mountains, Coll. Oakes) est une espèce parfaitement distincte de notre plante. Je l'ai nommée *E. pusilla* dans mon herbier." That Godet also named another species in his herbarium *E. pusilla* is indicated by the fact that, in his *Monographie der Gattung Euphrasia*, Wettstein cites the herbarium-name *E. pusilla* Godet as a synonym of *E. arctica* Lange (*E. latifolia* Pursh, as to the Labrador plant); while the Lake Superior plant of Gray's 2nd edition, where the name *E. pusilla* was published, was also *E. arctica;* and the plants known to Gray from "northward" were partly *E. arctica*, partly at least two other species, *E. canadensis* Townsend and *E. disjuncta* Fernald & Wiegand. The name *E. pusilla*, therefore, has not a clear signification nor did the publication of it by Gray in a somewhat incidental manner as having been applied to a "variety" of *E. officinalis* give it the standing necessary for a specific name.

This treatment of *Euphrasia* in temperate eastern America was carried unchanged through the next three editions of the *Manual*, but in the *Synoptical Flora* Gray treated some of the common plants of the coast of eastern Maine and adjacent Canada (*E. americana* and *E. stricta*) as *E. officinalis*, "perhaps introduced from Europe";[3] while the plants known to Gray from the alpine region of the White Mountains (*E. Oakesii*), the shore of Lake Superior (*E. arctica*), the northern Rocky Mountains (*E. disjuncta*), the Aleutian Islands (*E. mollis*) and "far northward" (*E. disjuncta, E. arctica*, etc.) were treated as var. *tatarica*, a plant known to the writers only from Eurasia and from the eastern counties of Quebec. This interpretation was followed by Watson & Coulter in the 6th edition of Gray's *Manual;* and, except that in 1873 Reeks, in an obscure publication upon Newfoundland, had published a new *E. purpurea*,[4] overlooked by the

[1] Gray, Man. 309 (1848).
[2] Gray, Man. ed. 2, 295 (1856).
[3] Gray, Syn. Fl. ii. pt. 1, 305 (1878).
[4] Reeks, List of Fl. Pl. and Ferns of Newfoundland, 4 (1873).

editors of *Index Kewensis* and by recent students of the genus, it was not until the appearance of Wettstein's *Monographie* in 1896 that it was recognized that in North America *Euphrasia* consists of several distinct species, most of them not satisfactorily referable to Old World species.

Wettstein definitely recognized in North America *E. americana* Wettstein, *E. latifolia* Pursh, in part (*E. arctica* Lange), *E. mollis* Ledeb., *E. Oakesii* Wettstein, *E. Rostkoviana* Hayne and, with doubt, *E. hirtella* Jordan. In 1898 Townsend added *E. canadensis* [1] (presumably including the Quebec plant which had been the basis of Wettstein's record of *E. Rostkoviana*, a well marked species not subsequently credited to North America); and in 1901, Robinson,[2] summarizing the knowledge of the American species at that time, recognized seven species and two varieties: *E. mollis*, *E. Oakesii*, *E. Williamsii* Robinson, *E. Randii* Robinson, *E. Randii*, var. (?) *Farlowii* Robinson, *E. latifolia*, *E. hirtella*, *E. americana*, and *E. americana*, var. *canadensis* (Townsend) Robinson.

In subsequent publications, for instance in the 7th edition of Gray's *Manual*, Robinson's treatment has been only slightly modified; but explorations to the northeast of the Manual range have recently brought together so much additional material of the genus that it has seemed advisable to present a new study of the Eyebrights based upon a somewhat extended field-knowledge of the plants and a prolonged herbarium-study; and, although the present summary of our knowledge necessarily leaves for further consideration some problematic plants of which we have inadequate material, it may prove useful as a fresh basis for further study of the genus.

Synopsis of North American Species and Varieties of Euphrasia.

A. Upper lip of corolla very shallowly bilobed; the lobes very short, rounded, entire, narrowly revolute, rarely erect: lower lip scarcely fan-shaped, not exceeding the upper: flowers very small, 2.2–4 (rarely 4.8) mm. long: bracts with blunt teeth. B.

B. Inflorescence capitate or subcapitate, the flowers closely crowded, only the 1–4 lowest pairs of bracts becoming slightly remote in maturity. C.

C. Corolla whitish to lilac: nodes below the head 2–5: leaves pubescent.....1. *E. Oakesii*.

[1] Townsend, Journ. Bot. xxxvi. 1, t. 381 (1898).
[2] Robinson, Rhodora, iii. 270–276 (1901).

C. Corolla deep brownish-purple or chocolate-color: nodes below the head 4–9.
Leaves glabrous: nodes below the head 4–7.....2. *O. Williamsii.*
Leaves pubescent: nodes below the head 5–9.
(2.) *E. Williamsii,* var. *vestita.*

B. Inflorescence becoming loose and elongate, flowers or capsules scattered, the mature spike with many remote bracts. D.

D. Leaves glabrous on both surfaces: corolla deep purple to cream-color.....3. *E. purpurea.*

D. Leaves pubescent on both surfaces.
Leaves sparingly crisp-pubescent on both surfaces, the primary ones 5–18 mm. long: corolla deep purple (rarely whitish) with dark lines.....(3.) *E. purpurea,* var. *Randii.*
Leaves very densely pubescent, the primary ones 2–7 mm. long: corolla whitish (rarely purple).
(3.) *E. purpurea,* var. *Farlowii.*

A. Upper lip of corolla plainly bilobed; the lobes somewhat reflexed from the base (not revolute), truncate, and from undulate to coarsely 3-toothed: lower lip in larger forms fan-shaped, spreading and very conspicuous: flowers rather large, 4–10 mm. long: bracts with acute or acuminate, rarely obtuse, teeth. E.

E. Bracts with acute or obtuse teeth: leaves pubescent. F.

F. Inflorescence nearly capitate, in maturity with the 1–3 lower pairs of bracts remote: teeth of bracts obtuse: leaves very pubescent: corolla 5–6 mm. long.....4. *E. mollis.*

F. Inflorescence spicate, becoming loose and elongate: teeth of bracts acute: leaves very pubescent to almost glabrous.
Internodes long: inflorescence open, the lowest bracts in maturity 2–5 cm. apart: bracts spreading: corolla 4–5.5(–6) mm. long
5. *E. disjuncta.*
Internodes short: inflorescence dense above, the lowest bracts in maturity 0.5–2 cm. apart: bracts ascending: corolla 5–7 mm. long
6. *E. arctica.*

E. Bracts with subulate or bristle-tipped teeth: leaves pubescent or glabrous. G.

G. Spikes comprising the larger portion of the plant, beginning near the base of the stem and branches. H.

H. Corolla 5–6.5 mm. long, with pale-lavender or bluish lines; the lower lip with the lateral lobes not strongly spreading.
Bracts oblong, pubescent: branches strongly ascending.
7. *E. hudsoniana.*
Bracts orbicular or broadly oval, glabrous: branches arcuate-ascending.....8. *E. canadensis.*

H. Corolla 6–8 mm. long. with dark-purple lines; the lower lip with wide-spreading lateral lobes.
Bracts glabrous.....9. *E. stricta.*
Bracts pubescent.....(9.) *E. stricta,* var. *tatarica.*

G. Spikes occupying only the upper half or third of the stem and branches: corolla large, 7–9 mm. long, with dark-purple lines; lower lip with wide-spreading lateral lobes.....10. *E. americana.*

1. E. Oakesii Wettstein, Monog. d. Gatt. Euphrasia, 142, t. 4. figs. 211–215, t. 12, fig. 6 (1896) and Bot. Gaz. xxii. 401 (1896); Britton & Brown, Ill. Fl. iii. 182, fig. 3327 (1898); Fernald, Rhodora, iii. 176 (1901); Robinson, ibid. 272 (1901); Eggleston, Rhodora, iv. 108 (1902); Fernald, Rhodora, ix. 163 (1907); Robinson & Fernald in Gray, Man. ed. 7, 733 (1908). *E. officinalis* Oakes in Hovey's Mag. xiii. 217 (1847); Gray, Man. 309 (1848) as to the Oakes plant; J. I. & A. B. Northrop, Bull. Torr. Bot. Cl. xvii. 27 (1890), in part. *E. pusilla* Godet acc. to Gray, Man. ed. 2, 295 (1856), as to the Oakes plant. *E. officinalis*, var. *tatarica* Wats. & Coult. in Gray, Man. ed. 6, 392 (1890), in part, not Benth. *E. orbicularis* Townsend acc. to Wettst. l. c. 143 (1896). *E. albimontana* Boiss. acc. to Wettst. l. c. (1896.)— Low, often very dwarf, 2–8 (rarely –12) cm. high, usually unbranched: stem crisp-pubescent: leaves 2–5 pairs below the inflorescence, smaller than the bracts, 1.5–7 mm. long, ovate to orbicular, crisp-pubescent on both faces: bracts similar in shape, with rounded teeth: inflorescence at first distinctly capitate, in maturity globose to ellipsoid, 0.5–2.5 cm. long, at most with the 1 or 2 lowest pairs of bracts becoming slightly remote: corolla 2.5–3.3 mm. long, whitish, with violet lines; upper lip shallowly bidentate, with narrow revolute entire margins; lower lip with oblong bidentulate lobes; throat yellow.— Exposed crests and bleak mountain summits, Labrador, Maine and New Hampshire. Labrador: on rocks, north shore of Battle Harbor, August 6–13, 1911, *C. S. Williamson*, no. 713. Maine: wet shelves and crevices, 1220–1375 m. altitude, north and west walls of North Basin, Mt. Katahdin, July 13–14, 1900, *Williams & Fernald*. New Hampshire: "in alpinis Montium Alborum," 1844, *Wm. Oakes;* gravelly plains, summits of White Mountains, August 16 and 28, 1877, *C. G. Pringle;* White Mountains, August 9, 1881, *W. H. Manning*; Crawford Path at Mt. Monroe, August 28, 1877, August 5, 1879, August 15, 1881, September 13, 1891, and July 8 and 31, 1893, *E. & C. E. Faxon*, August 15–20, 1898, *W. W. Eggleston*, August 4, 1901, *E. F. Williams*; open shaly ground, head of Oakes Gulf, August 4, 1901, *E. F. Williams & B. L. Robinson*, Pl. Exsicc. Gray., no. 61; Oakes Gulf, about 1375 m., August 17–24, 1901, *W. W. Eggleston*, no. 2408; edge of Oakes Gulf, August 14, 1902, *A. S. Pease.*

1a. Forma **lilacina**, n. f., corollae lobis valde lilacinis.

Lobes of the corolla deep lilac.— Labrador: exposed crests of limestone and calcareous sandstone terraces, Blanc Sablon, August 6, 1910, *Fernald & Wiegand*, no. 3988 (type in Gray Herb.).

2. E. Williamsii Robinson, Rhodora, iii. 272 (1901); Fernald, Rhodora, ix. 163 (1907); Robinson & Fernald in Gray, Man. ed. 7,

733 (1908); Britton & Brown, Ill. Fl. ed. 2, iii. 218 (1913).— Plant simple or sparingly branched, 3–12 cm. high: stem pubescent: leaves 4–7 pairs below the inflorescence, 2–9 mm. long, glabrous on both surfaces: inflorescence at first capitate, in maturity cylindric, 0.7–5 cm. long, usually with only the 1–4 lowest pairs of bracts becoming a little remote: bracts similar to and only slightly larger than the leaves, with obtuse teeth: corolla 2.5–4 mm. long, deep brownish-purple, similar in size and shape to that of *E. Oakesii*.— Barren ledges, alpine region of Mt. Washington, New Hampshire. New Hampshire: Cape Horn, Mt. Washington, August 6, 1896 and August 5, 1901, *E. F. Williams;* ledges near 5th Mile Post, Mt. Washington, August 6, 1896, *E. & C. E. Faxon*, September 12, 1904, and August 19, 1907, *A. S. Pease*, nos. 4107 and 10,595; stony ground and crevices of rocks, "Alpine Garden," Mt. Washington, August 5, 1901, *E. F. Williams & B. L. Robinson*, Pl. Exsicc. Gray, no. 60; Lion's Head, Mt. Washington, August 28, 1909, *A. S. Pease*, no. 12,527.

Very close to *E. Oakesii* but differing in the usually larger stature, with the more numerous cauline leaves only slightly smaller than the bracts; in the usually remote lower bracts; and in the deep chocolate-color of the corolla. In this species, as in several others, there is a glabrous and a pubescent trend: the former the typical plant of New Hampshire, the latter an alpine plant of Newfoundland.

2a. E. Williamsii, var. **vestita**, n. var., foliis pubescentibus, pilis crispis; nodiis infra inflorescentiam 5–9; bracteae dentibus plerumque acutiusculis.

Leaves crisp-pubescent, 5–9 pairs below the inflorescence: teeth of the bracts mostly acutish.— Newfoundland: dry diorite peak, Lookout Mountain, Bonne Bay, August 26, 1910, *Fernald & Wiegand*, no. 4009 (type in Gray Herb.); dry exposed thin soil on summit-ledges altitude 335–520 m., Blomidon, July 31 and August 7, 1908, *Eames & Godfrey*, nos. 8068 and 8069.

3. E. purpurea Reeks, List of Fl. Pl. and Ferns of Newfoundland, 4 (1873).— Simple or usually branched from near the base, 0.3–4 dm. high: stems crisp-pubescent· leaves glabrous or nearly so on both surfaces, with glabrous or ciliate margins, ovate-oblong to nearly orbicular, the primary ones 5–15 (rarely –18) mm. long; teeth from rounded to barely acute: bracts similar: inflorescences becoming very elongate; the primary one $\frac{1}{2}$–$\frac{3}{4}$ the full height of the plant, with 10–20 somewhat remote pairs of bracts; the lower bracts about one-half as long as the internodes: corollas 2.5–4 mm. long, from deep to pale purple with darker lines; throat usually with a yellow spot; upper lip shallowly notched, with revolute or rarely erect entire or bidentulate lobes; lower lip not distinctly fan-shaped, with ascending truncate or bidentulate linear or oblong lobes.— Grassy or peaty banks and brackish shores, western Newfoundland and eastern Quebec

to southern New Brunswick. NEWFOUNDLAND: damp shores, Port Saunders, August 6, 1910, *Fernald, Wiegand & Kittredge*, no. 3995; bog back of the strand, Cow Head (Reeks's type locality), July 22, 1910, *Fernald & Wiegand*, no. 3985; rocks and gravelly strand, Southeast Arm of Bonne Bay, August 31, 1910, *Fernald & Wiegand*, nos. 4006, 4007; moist banks in deep shade and in dry fields, near sea level, Bay of Islands, July 27 and 28, 1908, *Eames & Godfrey*, no. 8070; damp thicket, Bay St. George, August 5–7, 1901, *Howe & Lang*, no. 996; open bog in wet woods overlying carboniferous sandstone, Stephenville, August 15, 1910, *Fernald, Wiegand & Kittredge*, no. 3996; damp sandy shores, St. George's, August 13, 1910, *Fernald, Wiegand & Kittredge*, no. 3992; grassy shores, Port à Port, August 15, 1910, *Fernald, Wiegand & Kittredge*, no. 4003. QUEBEC: edge of brackish marsh, Pointe au Maurier, Canton Charnay, Saguenay County, August 26, 1915, *St. John;* turfy bank, La Grande Romaine, Canton Lagorgendière, Saguenay County, September 2, 1915, *St. John;* knolls in salt marsh, St. John (or Douglastown) River, August 23, 1904, *Collins, Fernald & Pease;* border of brackish marsh, Barachois de Malbaie, August 13, 1907, *Fernald*, no. 1168. MAGDALEN ISLANDS:[1] boggy margin of the strand at the Narrows, Alright Island, August 21, 1912, *Fernald, Long & St. John*, no. 8021; border of brackish marsh near Hospital Point, Grindstone Island, July 18, 1912, *Fernald, Bartram, Long & St. John*, no. 8017; knolls in the marsh at the border of a brackish pond, and on dry turfy crests of a sandstone sea-cliff, southwest of Étang du Nord village, Grindstone Island, August 15, 1912, *Fernald, Long & St. John*, nos. 8019, 8020; grassy bank near shore, Amherst Island, August 25, 1914, *St. John*, no. 1646. PRINCE EDWARD ISLAND: in grass upon damp brackish sands, Cape Aylesbury, August 29, 1912, *Fernald, Long & St. John*, no. 8022. NOVA SCOTIA: Bay St. Lawrence, Cape Breton Island, August 14, 1904, *J. R. Churchill.* NEW BRUNSWICK: along the sea-coast, Petitcodiac, August, 1884, *J. Britain*, Herb. Geol. Surv. Can. no. 17,438.

3a. E. PURPUREA, forma **candida**, n. f., corollae lobis albicantibus.

Lobes of the corolla whitish.— QUEBEC: on anorthosite, east side of Great Basque, Seven Islands, August 15, 1907, *C. B. Robinson*, no. 943. MAGDALEN ISLANDS: knolls at border of brackish marsh, East Cape, Coffin Island, July 19, 1912, *Fernald, Bartram, Long & St. John*, no. 8018 (TYPE in Gray Herb.).

Forma *candida* seems closely to match material distributed by Birger as *E. bottnica* Kihlm. in Wettst., l. c. 299 (1896) from Sweden. If the pale-flowered *E. bottnica* of Scandinavia and *E. purpurea*, forma *candida* of northeastern America prove to be identical, we should

[1] Although at present belonging politically to Gaspé County, Quebec, the Magdalen Islands are so remote that they are here treated as a distinct geographic area.

naturally expect the more common American plant with purple flowers to be found in Scandinavia.

3b. E. PURPUREA, var. **Randii** (Robinson), n. comb. *E. officinalis*, form, Rand & Redfield, Fl. Mount Desert, 133 (1894). *E. Randii* Robinson, RHODORA, iii. 273 (1901); Kennedy, RHODORA, iv. 26 (1902); Robinson & Fernald in Gray, Man. ed. 7, 733 (1908); Cushman, RHODORA, xi. 13 (1909); Fernald & Wiegand, RHODORA, xii. 105 and 143 (1910); Britton & Brown, Ill. Fl. ed. 2, iii. 218, fig. 3842 (1913); Knowlton, RHODORA, xvii. 148 (1915).— Leaves and bracts sparingly crisp-pubescent on both surfaces.— Exposed turfy knolls, peaty crevices of sea-cliffs and borders of brackish marshes, Labrador to Gaspé Co., Quebec, and southward to the coast of Maine. LABRADOR: Cartwright, August 20, 1902, *Amos P. Brown* (herb. Phil. Acad.). QUEBEC: open sterile soil, western end of Bonaventure Island, August 7 and 8, 1907, *Fernald & Collins*, no. 1167. NOVA SCOTIA: on rocks, Englishtown, Cape Breton, August 2, 1898, *J. Macoun*, Herb. Geol. Surv. Can., no. 19,898; on rocks, Bell's Island, August 11, 1910, *J. Macoun*, Herb. Geol. Surv. Can., no. 80,663; in humus, edge of sea cliffs, Black Hole, Scott's Bay, August 24, 1902, *Fernald;* damp earth, Sable Island, July and August, 1899, *J. Macoun*, Herb. Geol. Surv. Can., nos. 22,557 and 22,557a; dune-hollow, Sable Island, August 21, 1913, *St. John*, no. 1319. NEW BRUNSWICK: Grand Manan Island, July 31, 1891, *J. R. Churchill.* MAINE: wooded crests of sea-cliffs, eastern side of Moose Island, Passamaquoddy Bay, August 16, 1909, *Fernald*, no. 2122; clay, gravel or humus, West Quoddy Head, Lubec, July 26 and August 2, 1909, *Fernald*, nos. 2120, 2121; in humus, Cutler, July 30, 1901, *G. G. Kennedy*, July 1–6, 1902, *Kennedy, Williams, Collins & Fernald*, July 12, 1902, *Kate Furbish*, August 27, 1902, *Fernald;* edge of sandy bluffs bordering ocean, Beal's Island, Jonesport, August 5, 1907, *Cushman & Sanford*, no. 1492; grassland and pastures, Great Cranberry Island, July 17, 1896, *E. L. Rand*, July 17, 1897 and July 20, 1899, *E. F. Williams & E. L. Rand;* grassy places, Great Duck Island, July 12, 1901, *E. L. Rand;* Baker Island, July 22, 1899, *E. L. Rand;* seawall, Southwest Harbor, July 26, 1892, *E. L. Rand;* East Brothers Island, July 31, 1904, *A. H. Norton;* North Libby Island, August 2, 1904, *A. H. Norton*.

3c. E. PURPUREA, var. RANDII, forma **albiflora**, n. f., corollae lobis albicantibus.

Lobes of the corolla whitish.— Eastern Newfoundland, Magdalen Islands and the coast of Maine from Penobscot Bay westward. NEWFOUNDLAND: border of salt marsh, Killigrew's, August 3, 1911, *Fernald & Wiegand*, no. 6164; crests of sea-cliffs, Western Head, New World Island, July 20, 1911, *Fernald, Wiegand & Bartram*, no. 6163. MAGDALEN ISLANDS: dry knolls, Brion Island, August 5, 1914, *St. John*, no. 1641. MAINE: turfy crests, Elwell Point, South

Thomaston, August 15, 1913, *Bissell, Fernald & Chamberlain* (*Fernald*, no. 10,404, TYPE in Gray Herb.); Dix Island (near Owl's Head), September, 1903, *Sheridan Plaisted;* Wooden Ball Island, August 24, 1905, *A. H. Norton.*

3d. E. PURPUREA, var. **Farlowii** (Robinson), n. comb. *E. Randii,* var. (?) *Farlowii* Robinson, RHODORA, iii. 274 (1901); Robinson & Fernald in Gray, Man. ed. 7, 733 (1908); Eames, RHODORA, xi. 98 (1909); Fernald & Wiegand, RHODORA, xii. 105 and 143 (1910).— Usually smaller than typical *E. purpurea* or var. *Randii*, 1–13 cm. high: leaves and bracts densely pubescent, mostly smaller, 2–7 mm. long, the flowers therefore appearing more conspicuous: corolla whitish; the lower lip somewhat more spreading; yellow spot in the throat smaller or wanting.— Exposed turfy crests or gravelly or sandy shores, Newfoundland and eastern Quebec to the eastern coast of Maine. NEWFOUNDLAND: top of dry sea-bluffs, Torbay, August 21–26, 1901, *Howe & Lang*, no. 1455; rocks by the sea, Placentia, July 20, 1911, *C. S. Williamson*, no. 490; Barred Islands, Notre Dame Bay, August 12, 1903, *J. D. Sornborger;* damp sand on pebbly tidal beach, Bay St. George, August 12, 1908, *Eames & Godfrey*, nos. 8066, 8067; damp sands, carboniferous area, Stephenville Crossing, August 14, 1910, *Fernald, Wiegand & Kittredge*, no. 3990. QUEBEC: grassy or mossy ledges, Isle Netagamiou, Archipelago of Petit Mécatina, Saguenay County, August 22 and 23 (form with purplish upper lip), 1915, *St. John*. MAGDALEN ISLANDS: dry knolls and sandy headlands, Brion Island, August 5 and 10, 1914, *St. John*, nos. 1642, 1647; dry turfy crests of a sandstone sea-cliff, southwest of Étang du Nord village, Grindstone Island, August 15, 1912, *Fernald, Long & St. John*, no. 8023. PRINCE EDWARD ISLAND: in grass, East Point, August 15, 1888, *J. Macoun*, Herb. Geol. Surv. Can., no. 17,439, in part. NOVA SCOTIA: on rocks, Englishtown, Cape Breton, August 2, 1898, *J. Macoun*, Herb. Geol. Surv. Can., no. 19,897; sea-cliffs, Neil's Harbor, July 28, 1909, *J. R. Churchill.* MAINE: open thin humus, Dog Island, Eastport, September, 1877, *W. G. Farlow*, August 3, 1909, *Fernald*, no. 2124; humus, West Quoddy Head, Lubec, July 26, 1909, *Fernald*, no. 2123: Jonesport, September 17, 1886, *N. T. Kidder.*

Fernald & Wiegand's no. 3991 from damp sand at Stephenville Crossing, Newfoundland, growing with no. 3990, is apparently this variety, though the flowers are larger (4 mm. long) and the fresh foliage had a characteristic lustrous bronze appearance which was very striking.

3e. E. PURPUREA, var. FARLOWII, forma **iodantha**, n. f., corollae lobis purpureis.

Lobes of the corolla purple.— MAINE: Matinicus Island, August 22, 1905, *A. H. Norton* (TYPE in Gray Herb.).

In its very small thick and densely pubescent leaves quite like var.

Farlowii, but with the deep-purple corolla of the glabrous *E. purpurea* and the sparingly pubescent var. *Randii*.

Euphrasia purpurea is our most variable species, in its more pronounced trends appearing like a number of species but without distinct concomitant characters. The characteristic purple corolla of typical *E. purpurea* and var. *Randii* is ordinarily a good character, but white-flowered forms of each are now known, thus breaking down a line of demarkation which was formerly used in distinguishing the very densely pubescent white-flowered var. *Farlowii*. The diagnostic value of the color of the corolla is now further put in doubt by the discovery by Mr. Norton of the Matinicus plant which in every other character matches extreme white-flowered var. *Farlowii* but which has the purple corolla of true *E. purpurea*. These extremes, although pronounced in the majority of colonies are, then, better treated as variants of one highly diversified species. It is noteworthy that true *E. purpurea* has its great development about the Gulf of St. Lawrence, where var. *Randii* is rare, and that it does not reach the Maine coast, where the latter is common; also that var. *Farlowii* is most abundant in Newfoundland, the Magdalen Islands and the Maritime Provinces but rare on the Maine coast.

4. E. MOLLIS (Ledeb.) Wettstein, Monog. d. Gatt. Euphrasia, 141, t. 4, fig. 205–210 and t. 12, fig. 5 (1896); Robinson, RHODORA, iii. 271 (1901). *E. officinalis*, var. *mollis* Ledeb. Fl. Ross. iii. 263 (1849).— Plant 4–10 cm. high, simple or occasionally with a pair of short spreading branches: leaves large for the size of the plant, 8–15 mm. long, ovate, coarsely crenate-dentate, copiously pubescent: inflorescence when young almost capitate, in maturity with the 1–3 lower pairs of bracts remote: bracts resembling the leaves: calyx densely pilose; its teeth barely acute: corolla scarcely overtopping the bracts, 5–6 mm. long, resembling that of *E. disjuncta* but deeper purple.— Grassy and sandy banks, Alaska, Islands of Bering Sea, and Kamtschatka. ALASKA: hillside, Akutan Island, August 21, 1907, *E. C. Van Dyke*, no. 95; other stations cited by Wettstein.

Very closely related to *E. disjuncta* and *E. arctica*, from both of which it differs in the more congested inflorescence, more copious pubescence, more rounded bracteal teeth, and more purple corolla. From *E. arctica* it also differs in its smaller corolla.

5. E. **disjuncta**, n. sp. *E. officinalis*, β Hook. Fl. Bor.-Am. ii. 106 (1838). *E. latifolia* Robinson, RHODORA, iii. 274 (1901), in part, perhaps also of Pursh in part. *E. hirtella* Robinson, l. c. 275 (1901), in part, not Jordan. *E. arctica* Robinson & Fernald in Gray, Man. ed.

7, 733 (1908); Britton & Brown, Ill. Fl. ed. 2, 217 (1913); in part, not Lange.— Gracilis 6–30 cm. alta simplex vel sub medio plus minusve ramosa, ramis plerumque arcte adscendentibus puberulis; foliis plerumque 9–16-jugis ovatis vel orbicularibus 8–18 mm. longis grosse crenato-dentatis sparse pubescentibus subremotis, internodiis plerumque 3 rare 7 cm. longis; spicis interruptis deinde perlongis; eis primariis maturis 0.5–2.7 dm. longis; bracteis 5–20-jugis remotis grandis patentibus vix reductis, dentibus grossis acutis; corollis 4–5.5(–6) mm. longis oculis luteis; labio superiore purpureo-tincto paullo 2-lobato, lobis paullo truncatis undulatis vel denticulatis semi-reflexis vix revolutis; labio inferiore albido purpureo-lineolato patente vix flabelliforme, lobis oblongis emarginatis; capsulis 4–5 mm. longis calycis dentibus peracutis vix aristatis aequantibus paullo pubescentibus retusisque.

Slender, 6–30 cm. high, simple or more or less branched below the middle; branches slender, usually strongly ascending, puberulent: leaves 9–16 pairs, or in dwarfed plants fewer, ovate or orbicular, 8–18 mm. long, coarsely crenate-dentate, sparingly pubescent, somewhat remote; the internodes mostly 3 (rarely to 7) cm. long, in dwarf plants shorter: spikes interrupted, becoming very long, the primary mature ones 0.5–2.7 dm. long: bracts 5–20 pairs, remote, large, spreading, scarcely reduced, with coarse acute teeth: corolla 4–5.5(–6) mm. long, with a yellow eye; upper lip tinged with purple, slightly 2-lobed, the lobes a little truncate, undulate or denticulate, semi-reflexed but scarcely revolute; lower lip white with purple lines, spreading but scarcely fan-shaped, the oblong lobes notched: capsule 4–5 mm. long, equaling the very acute but not aristate calyx-teeth, slightly pubescent, barely retuse.— Damp open places, Labrador and Newfoundland to northern Maine, Alberta, Mackenzie and Alaska. LABRADOR: 20 miles north of Nachvak, August 28, 1908, *H. S. Forbes;* crevices of rock, Nachvak, July 29, 1884, *R. Bell;* Flint Island, near Port Manvers, August 22, 1908, *Owen Bryant;* Hopedale, August 11, 1891, *Bowdoin College Expedition*, no. 242; rocky places, Battle Harbor, August, 1911, *C. S. Williamson;* springy banks and damp hillsides, Forteau, July 30, 1910, *Fernald, Wiegand & Kittredge*, no. 3994; on the gneiss plain in damp soil, Blanc Sablon, July 31 and September 3, 1910, *Fernald & Wiegand*, nos. 3987, 4012. NEWFOUNDLAND: grassy slopes near shore, Black Island, Notre Dame Bay, July 20, 1911, *Fernald, Wiegand & Bartram*, no. 6165; ledges, talus and gravel, north bank of Exploits River below the falls, Bishop Falls, July 28, 1911, and Grand Falls, July 22 and August 12, 1911, *Fernald, Wiegand & Darlington*, nos. 6166, 6167, 6168, and 6169 (TYPE in Gray Herb.); granitic ledges and gravel along a brook, Quarry, August 23, 1911, *Fernald & Wiegand*, no. 6170; gravel along Kitty's Brook, August 25, 1911, *Fernald & Wiegand*, no. 6171; grassy strand of Ingornachoix Bay, August 2, 1910, *Fernald, Wiegand & Kittredge*, no. 3986; calcareous rocks and talus, entrance to Port Saunders

Harbor, August 1, 1910, *Fernald, Wiegand & Kittredge*, no. 3993; grassy fields overlying conglomerate limestones and calcareous sandstones, Cow Head, July 22, 1910, *Fernald & Wiegand*, no. 3983; barrens at base of the serpentine tablelands, Bonne Bay, August 27, 1910, *Fernald & Wiegand*, no. 4005; Southeast Arm, Bonne Bay, August 31, 1910, *Fernald & Wiegand*, no. 4011; heath on diorite tableland, altitude about 380 m., "Lookout Mountain," Bonne Bay, August 26, 1910, *Fernald & Wiegand*, no. 4010; low thicket on coast, Bay of Islands, August 6, 1908, *Eames & Godfrey*, no. 8071; park-like openings in damp woods and in open peat bogs back of Curling (Birchy Cove), July 5–August 10, 1910, *Fernald, Wiegand & Kittredge*, nos. 3979, 3980, 3982; moist grassy places on highest peak at about 650 m. altitude, Blomidon, July 31, 1908, *Eames & Godfrey*, no. 8072; diorite tableland, altitude about 550 m., Blomidon, August 22, 1910, *Fernald & Wiegand*, no. 4004; springy banks along Harry's River, August 18, 1910, *Fernald & Wiegand*, no. 4008; dry limestone barrens and in wet runs and boggy spots, upper slopes and tablelands, altitude 200–300 m., also in mossy spruce woods on slope, Table Mountain, Port à Port, August 16, 1910, *Fernald & Wiegand*, nos. 3997, 3999, 4000. Quebec: Esquimaux River, lat. 51° 59′, July 27, 1882, *J. A. Allen*, no. 69; grassy shores, Vieux-Fort, Canton Pontchartrain, St. Paul, Canton Chevalier, and Bradore, Canton Brest, Saguenay County, July 25, 26 and 29, 1915, *St. John*. New Brunswick: mountain slopes, Gloucester County, 1867, *J. Fowler*, Herb. Geol. Surv. Can., no. 17,445. Maine: St. John River, *G. L. Goodale*. Alberta: Rocky Mountains, *Drummond;* in boggy spots, altitude 2530 m., mountains north of Devil's Lake, August 18, 1891, *J. Macoun*, Herb. Geol. Surv. Can., no. 17,446. Mackenzie: grassy places, Lewes River, lat. 62°, August 20, 1887, *Dawson*, Herb. Geol. Surv. Can., no. 17,449. Alaska: mouth of Chilkat River, lat. 59°, 1883, *F. Meehan;* Dalton Landing, vicinity of Yakutat Bay, August 15, 1892, *Frederick Funston*, no. 125; Kadiak Island (Gray Herb.); Shumagin Islands, 1871–72, *M. W. Harrington;* grassy slopes, St. Paul's Island, August 3, 1891, *J. M. Macoun*.

The flowers of *E. disjuncta* are smaller than those of any other species in the group which has the lobes of the upper lip strongly reflexed. The pubescent leaves and bracts, the small flowers, open inflorescence, and large spreading bracts with merely acute teeth are the chief characteristics.

6. E. arctica Lange in Rostrup, Bot. Tidskr. iv. 47 (1870); Robinson & Fernald in Gray, Man. ed. 7, 733 (1908), in large part; Britton & Brown, Ill. Fl. ed. 2, 217, fig. 3840 (1913), in large part. *E. latifolia* Pursh Fl. Am. Sept. ii. 430 (1814), as to Labrador plant; Wettstein, Monog. d. Gatt. Euphrasia, 136 (1896); Britton & Brown, Ill. Fl. iii. 182, fig. 3325 (1898); Robinson, Rhodora, iii. 274 (1901);

in part not *E. latifolia* L. (1753). *E. officinalis*, β. *latifolia* Lange, Overs. ov. Grönl. Flora, 79 (1880), as to plant. *E. officinalis*, β *tatarica* Benth. in DC. Prodr. x. 552 (1846), in part, not *E. tatarica* Fischer (1825). *E. officinalis*, γ *alpestris* b. *arctica* Herder, Bull. Soc. imp. nat. Mosc. 1884, pars. 3, 46. *E. officinalis*, var. *hyperborea* Favr. acc. to Wettstein, l. c. (1896). *E. hirtella* Robinson, RHODORA, iii. 275 (1901), in large part, not Jordan.— Plant 5–25 cm. high, slender: stem pubescent: branches few, rarely many, from the middle of the stem or below, usually strongly ascending; internodes mostly 8–15 mm. long: leaves 5–15 mm. long, mostly rather small, from copiously to sparingly pubescent: inflorescence dense, uninterrupted above (except in "drawn" plants), the mature primary spikes 3–15 cm. long: bracts 7–20 pairs, usually rather small, ascending and often imbricated, the lowest in maturity 0.5–2 cm. apart; teeth acute: corolla white with pale lavender lines and often darker upper lip, 5–7 mm. long, exceeding the bracts; lobes of the lower lip nearly parallel.— In dry or rarely damp, often calcareous, soils, mountains of northern Europe, Iceland and Greenland, south to Newfoundland, eastern Quebec, Michigan and Minnesota. LABRADOR: Kangalaksiorvik Bay, September 1–10, 1908, *Owen Bryant;* Nachvak, September 4, 1900, *E. B. Delabarre;* Rama, July–August, 1899, *A. Stecker*, no. 343; Hopedale, August 4–6, 1897, *J. D. Sornborger*, no. 82; Indian Harbor, Hamilton Inlet, August 2, 1891, *Bowdoin College Expedition*, no. 193. NEWFOUNDLAND: dry limestone barrens, upper slopes and tablelands, altitude 200–300 m., Table Mountain, Port à Port Bay, August 16, 1910, *Fernald, Wiegand & Kittredge*, no. 4001; QUEBEC: grassy ledge, Isle Netagamiou, Archipelago of Petit Mécatina, Saguenay County, August 22, 1915, *St. John;* damp gravelly places, Jupiter River, Anticosti, August 27, 1883, *J. Macoun*, Herb. Geol. Surv. Can., no. 17,441; cliff-shores of Gaspé Bay, Douglastown, August 22, 1904, *Collins, Fernald & Pease;* Bonaventure conglomerate (calcareous) sea-cliffs, Bonaventure Island, August 7 and 8, 1907, *Fernald & Collins*, no. 1166; summit of Mt. Ste. Anne, Percé, August 18, 1904, *Collins, Fernald & Pease;* everywhere in dry open soil and sterile turfy places, mouth of Grand River, Gaspé County, August 11–15, 1904, *Collins, Fernald & Pease;* damp mossy and grassy slope, Pointe Nouvelle, Hope Township, July 30, 1902, *Williams & Fernald;* gravelly beach at Paspébiac Lighthouse, July 27 and 29, 1912, *Williams & Fernald:* wet red-sandstone bluffs and steep slopes between Baldé and the Baie des Chaleurs, Bonaventure River, August 5, 6 and 8, 1904, *Collins, Fernald & Pease.* UNGAVA: Fort George, July 17, 1899, *A. P. Low*, Herb. Geol. Surv. Can., no. 62,569. ONTARIO: mouth of Albany River, July 25, 1904, *W. Spreadborough*, Herb. Geol. Surv. Can., no. 62,568; north shore of Lake Superior, 1848, *Agassiz;* Lake Superior, 1879, *T. S. Roberts.* MICHIGAN: Isle Royale, 1849, *Whitney*, July 30, 1909, *W. S. Cooper*, no. 76. MINNESOTA: Good Harbor, August 14,

1868, *H. Gillman*. Keewatin: Churchill, lat. 58° 50′, July 29 and August 3, 1910, *J. M. Macoun*, Herb. Geol. Surv. Can., nos. 79,380, 79,381.

Intermediate between *E. disjuncta* and *E. stricta*, var. *tatarica*. Extremes are difficult to distinguish from those plants. From the former *E. arctica* differs in the shorter internodes, denser inflorescence with more ascending bracts, more acute bracteal teeth, and slightly larger corolla. From the latter it may be distinguished by the less subulate bracteal teeth and smaller corolla with paler lines and with less spreading lobes of the lower lip.

Wettstein took up for this boreal species the name *E. latifolia* Pursh, not L. (or, as Pursh said, Willdenow), because the Linnean (and Willdenowian) *E. latifolia* does not belong to the genus *Euphrasia* as now interpreted and because the Labrador plant seen by Pursh *was* a true *Euphrasia* (the plant here treated as *E. arctica*). It is clear, however, from Pursh's treatment that he had no intention of publishing a new species but merely copied literally from Willdenow the description of the Linnean *E. latifolia* of the Mediterranean region, a plant belonging in the genus *Parentucellia*.

7. E. **hudsoniana**, n. sp. Planta 5–22 cm. alta; caulibus pubescentibus simplicibus vel inferne sparse ramosis, ramis longis valde adscendentibus, internodiis inferioribus 1.5–4 cm. longis; foliis oblongis 15 mm. longis sparse pubescentibus, dentibus paucis acutis; spicis longis, eis primariis in maturitate 0.5–1.5 dm. longis, internodiis inferioribus 1–3 cm. longis; bracteis 5–15-jugis grandis oblongis 7–15 mm. longis adscendentibus grosse acutissimeque serratis, dentibus aristatis; corolla 5.5–6 mm. longis albidis violaceo-lineolatis; labio superiore purpureo-tincto bilobato, lobis semireflexis; labii inferiori lobis vix divergentibus.

Plant 5–22 cm. high; stem pubescent, simple or sparingly branched below; branches long, strongly ascending; lower internodes 1.5–4 cm. long: leaves oblong, 15 mm. long in the larger plants, sparingly pubescent, with a few very coarse acute teeth: spikes rather long; the primary ones in maturity 0.5–1.5 dm. long, with the lowest internodes 1–3 cm. apart: bracts 5–15 pairs, large, oblong, 7–15 mm. long, ascending, coarsely and very sharply aristate-toothed: corolla 5.5–6 mm. long, whitish with pale violet lines; upper lip suffused with purple, bilobed, the lobes semi-reflexed; lower lip with the lobes scarcely divergent.— Grassy places about Hudson Bay; little known. Ungava: Koaksoak River, August, 1896, *Spreadborough* (type in Gray Herb.); duplicate types in Herb. Geol. Surv. Can., nos. 14,472 & 62,237. British North West America: specimen coll. *Franklin Expedition; King* in Back's Voyage. Macoun's material (Herb.

Geol. Surv. Can., no. 17,448) from Bow River Pass, Alberta, is overripe but has similar bracts.

Similar to *E. canadensis* but with pubescent leaves and bracts, the latter oblong and usually more ascending and larger than in *E. canadensis*. In outline of foliage suggesting the European *E. salisburgensis* Funck, which, however, has the leaves and bracts pectinate, the spike denser, and the lower internodes rarely 1 cm. long.

8. E. CANADENSIS Townsend, Journ. Bot. xxxvi. 1, t. 381 (1898); Robinson & Fernald in Gray, Man. ed. 7, 733 (1908). *E. officinalis* Michx. Fl. Bor.-Am. ii. 16 (1803); Pursh, Fl. ii. 430 (1814); Pringle, Bull. Torr. Bot. Cl. vi. 366 (1879); *J. I. & A. B. Northrop*, Bull. Torr. Bot. Cl. xvii. 27 (1890), in part; not L. *E. americana*, var. *canadensis* Robinson, RHODORA, iii. 276 (1901).— Plant rather low, 0.5–2.5 dm. high, simple or more or less bushy-branched from below the middle; branches mostly arcuate-ascending; internodes short: leaves of medium size, the primary 0.5–1 cm. long, glabrous, the teeth acute or obtuse: spikes very elongate, dense above, the primary one nearly the full height of the plant: bracts spreading, rarely at all imbricated above, with bristle-tipped teeth, the lowest in maturity 0.3–1.5 (rarely –2.5) cm. apart: corolla 5–6.5 mm. long, white with lavender or bluish veins and with a violet tinge on the upper lip; upper lip 2-lobed, the lobes half-reflexed, truncate and shallowly toothed; lower lip only slightly fan-shaped.— Open barren fields and turfy roadsides, mostly about settlements, Quebec, the Maritime Provinces and northern New England. QUEBEC: open ground, very common, Rivière Blanche, August 8, 1904, *F. F. Forbes;* Little Métis, August 1, 1906 and August 22, 1907, *J. Fowler;* common in open sterile soil, New Richmond, July 28–August 1, 1904, *Collins, Fernald & Pease;* open damp spots, Carleton, July 23, 24 and 27, 1904, *Collins, Fernald & Pease;* turfy spots and open pastures, Bic, July 16 and 18, 1904 and July 27, 1907, *Fernald & Collins;* crevices of rock, damp hollows, etc., Rivière du Loup, August 2, 1902, *Williams & Fernald;* fields, Temiscouata, July 26, 1878, "probably introduced from Europe," *C. G. Pringle;* Tadousac, August 5, 1902, *E. F. Williams*, October, 1909 *Emily F. Fletcher;* St. Alphonse, Ha Ha Bay, August 5, 1902, *E. F. Williams;* near Ouatchouan Falls, Lake St. John, August 29, 1904, *W. F. Wight*, no. 224; old fields, Cap à l'Aigle, July, August, 1905, *J. Macoun*, Herb. Geol. Surv. Can., nos. 67,825, 67,826; Quebec, July 21, 1792, *Michaux* (herb. Michx.), *Houghton*, *Jos. Blake*, et al.; fields, roadsides, and in serpentine and soapstone gravels, East Broughton, August 23, 1915, *M. L. Fernald & H. B. Jackson;* open pasture and wet ground, Georgeville, July 10 and 23, 1902, *J. R. Churchill.* PRINCE EDWARD ISLAND: Malpeque, July 20, 1904, *J. Fowler.* NOVA SCOTIA: L'Ardoire, Cape Breton, August 1, 1892, *Walter Faxon;* Barrington Passage, July 9, 1910, *J. Macoun*, Herb. Geol. Surv. Can., no. 80,657. NEW BRUNSWICK: Shediac, August 5,

1904, *J. Fowler;* Campbellton, July 1, 1877, *R. Chalmers*, Herb. Geol. Surv. Can., no. 17,447. Maine: barren fields about Boundary Lake, August 12, 1902, *Eggleston & Fernald;* dry open places, Frenchville, August 12, 1901, *Williams, Robinson & Fernald*, Pl. Exsicc. Gray., no. 62; dry field, Hamlin, September 18, 1896, *Fernald;* Monhegan Island, 1901, *C. F. Jenney,* 1902, *F. Grace Smith,* no. 77. New Hampshire: at north door of Glen House, July 28, 1865, *Wm. Boott;* roadside, base of Mt. Washington, August 10, 1878, *J. A. Allen;* damp mossy places on side of road about $1\frac{1}{2}$ miles from Glen House toward Jackson, August 9, 1902, *F. F. Forbes;* roadside $\frac{1}{2}$ mile south of Glen House, September 5, 1908, *A. S. Pease*, no. 11,550; lawn of Glen House, August 2, 1907, *A. S. Pease,* no. 10761; road between Glen House and Tuckerman's Ravine, August 19, 1903, *A. H. Moore,* no. 1424.

E. canadensis is closely related to *E. arctica* and *E. stricta.* From the former it differs in the glabrous foliage and more aristate bracteal teeth; from the latter in the smaller corolla with paler veins and less spreading lateral lobes of the lower lip, and the usually lower stature, with more basal branching and more spreading bracts. It is found in fields, by roadsides and in other somewhat artificial habitats in the neighborhood of settlements and has every appearance of an introduced plant. Pringle, when he collected it in Temiscouata County, Quebec, in 1878, wrote of it, "doubtless introduced from Europe" (Bull. Torr. Bot. Cl. vi. 366). Nevertheless, as pointed out by Townsend, the plant does not exactly match any European species; and although strongly inclined to believe the species a recent introduction in Quebec and northern New England, we have sought in vain for an exact match for it in the Old World species. Its nearest affinity is apparently with *E. nemorosa* Pers., but it usually begins flowering from nearer the base and its branches are more confined to the base than in the European *E. nemorosa.* *E. canadensis* is usually lower than *E. nemorosa* and has rather larger leaves and bracts. In this connection it is significant that the plant was collected by Michaux at Quebec in 1792, the material in his herbarium being quite typical *E. canadensis.* Townsend, in publishing the species, said: "As to the history of *E. canadensis,* it is difficult to form an opinion without further knowledge of its present geographical distribution; whether it be an importation from Europe at a remote though historic period, modified by climatic or other influences, or whether it be the descendant of an ancient but indigenous form. As regards *E. americana* Wetts., Prof. Wettstein inclines to the idea of importation, as stated in his Monograph, p. 128."

The three species, *E. canadensis*, *E. americana*, and *E. stricta*, form, with the local and very distinct *E. hudsoniana* of Ungava, a group of species quite unlike our other large-flowered Euphrasias in the bristle-tipped teeth of the bracts, in this character being like several of the common European plants. *E. stricta* and its var. *tatarica* are European and possibly introduced in America, though the variety seems like an indigenous plant. It is possible, then, that *E. canadensis* and *E. americana* are derivatives of *E. nemorosa* and of *E. stricta* (doubtfully indigenous in America) or of some closely related European species introduced into eastern Canada and eastern Maine by the earliest European colonists, in the 16th or 17th centuries; and, being annuals, the plants have, during hundreds of generations, departed sufficiently from their ancestors now to stand as true American species. (See also notes under *E. stricta* and *E. americana*).

The Monhegan Island material referred here is not in satisfactory condition and further collections may show it to belong, rather, to *E. stricta*.

9. E. STRICTA Host, Fl. Austr. ii. 185 (1831); Wettstein, Monogr. d. Gatt. Euphrasia, 93 (1896), which see for detailed synonymy. *E. borealis* Fernald, RHODORA, ix. 163 (1907) and x. 201 (1908), not (Towns.) Wettst.— Plant 0.5–3 dm. high, usually rather strict, with a few short ascending branches mostly from near the middle of the stem, occasionally bushy-branched; internodes rather short, 1–2 cm. long: leaves small, the primary ones 3–10 mm. long, glabrous, few-toothed; the teeth coarse, acute: spikes long, dense and rather slender, the primary becoming 0.4–2.5 dm. long: bracts 10–30 pairs, glabrous, small, ascending, the upper imbricated, the lowest rarely more than 1 cm. apart; teeth very sharp, bristle-tipped: corolla large, 6–8 mm. long, exceeding the bracts, pale with deep-violet lines; upper lip more purplish, bilobed, each lobe semi-reflexed, truncate and denticulate; lower lip fan-shaped, the lateral lobes wide-spreading.— Dry fields and sterile grasslands, Newfoundland to Maine and northern New York; also Europe. NEWFOUNDLAND: fields, St. John's, July 31, 1894, *Robinson & Schrenk*, no. 102; damp soil, Torbay, August, 1901, *Howe & Lang*, no. 1450. QUEBEC: damp hollow, near mouth of Grand River, Gaspé County, August 11–15, 1904, *Collins, Fernald & Pease;* dry calcareous soil, Les Murailles, Percé, August 17, 1904, *Collins, Fernald & Pease;* sandy grassland, New Carlisle, July 28, 1902, *Williams & Fernald;* gravelly soil, Giroux, July 26, 1902, *Williams & Fernald.* PRINCE EDWARD ISLAND: grassy roadsides near Cozen's Pond, August 29, 1912, *Fernald, Long & St. John*, no. 8027. NEW BRUNSWICK: Campbellton, August 29, 1905, *J. Fowler;* pasture, Miscou Harbor, August 26, 1913, *S. F. Blake*, no. 5543a.

Nova Scotia: Commeauville, August, 1900, *L. L. Dame;* La Have River, August 6, 1910, *J. Macoun,* Herb. Geol. Surv. Can., no. 80,660. Maine: Machiasport, August, 1898, *M. A. Barber;* South West Harbor, August 30, 1890, *E. L. Rand,* September 19, 1892, *Fernald;* fields, Great Cranberry Isle, August 5, 1890, *J. H. Redfield,* 1897–98, *E. L. Rand;* Baker's Island, July 22, 1901, *Rand;* South Duck Island, August 9, 1893, *Redfield;* fields and roadsides, Sunshine, Deer Isle, August 26, 1912, *A. F. Hill,* no. 294; Swan Island, August, 1910, *Kate Furbish;* clearings and fields, Dark Harbor, Islesboro, August 14, 1913, *Woodward, Bissell & Fernald;* roadside, Clinton, August 13, 1911, *R. C. Bean;* roadsides and dry grassy door-yard, Bayville, August 30, 1911, *F. O. Grover;* Portland Road, Brunswick, August 26, 1913, *Kate Furbish.* New York: pasture, Waddington, August 29, 1914, *Orra Parker Phelps,* no. 95.

Similar, in the long spikes extending nearly to the base of the plant, to *E. canadensis,* but the branches fewer and less basal and the corolla slightly larger, with darker lines and with wide-spreading lobes of the lower lip; and the bracts less spreading and with slightly sharper teeth. The collections of *E. stricta* are all of recent date and the habitats so generally are fields, roadsides, lawns, and other situations associated with civilization that it seems that *E. stricta* has been recently introduced from Europe. In Maine it is spreading rapidly and in recent years has extended into well known areas where it is reasonably certain that it formerly did not occur.

9a. E. stricta, var. **tatarica** (Fischer), n. comb. *E. tatarica* Fischer in Spreng. Syst. Veg. ii. 777 (1825); Wettstein, Monogr. d. Gatt. Euphrasia, 88 (1896), which see for detailed synonymy. *E. officinalis, β. tatarica* Benth. in DC. Prodr. x. 552 (1846), in part.— Resembling *E. stricta* in habit, etc., but with the leaves and bracts pubescent and the bracteal teeth not so sharp.— Apparently confined to gravelly slopes or cliffs in the maritime district of Gaspé, Saguenay Counties, Quebec; Eurasia. Quebec: grassy shore, Natashquan, Saguenay County, September 6, 1915, *St. John;* grassy shore, Betchouane, Seigniory of Mingan, Saguenay County, September 9, 1915, *St. John;* dry calcareous soil, detritus or thin turf, summits and slopes, abundant at Percé, August, 1904, *Collins, Fernald & Pease;* Mont Rouge, Percé, July 23, 1905, *Williams, Collins & Fernald;* cliff-shores of Gaspé Bay, Douglastown, August 22, 1904, *Collins, Fernald & Pease;* dry open soil, mouth of Grand River, August 11–15, 1904, *Collins, Fernald & Pease.*

Possibly introduced, but seeming like an indigenous plant.

10. E. americana Wettstein, Monogr. d. Gatt. Euphrasia, 127 (1896) and Bot. Gaz. xxii. 401 (1896); Britton & Brown, Ill. Fl. iii. 182, fig. 3326 (1898); Robinson, Rhodora, iii. 275 (1901); Kennedy,

Rhodora, iv. 26 (1902); Moulton, ibid. 189 (1902); Robinson & Fernald in Gray, Man. ed. 7, 733 (1908); Cushman, Rhodora, xi. 13 (1909); Fernald & Wiegand, Rhodora, xii. 103, 143 (1910). *E. officinalis* Gray, Syn. Fl. ii. pt. 1, 305 (1878), in part; Redfield, Bull. Torr. Bot. Cl. xii. 103 (1885) and xiii. 232 (1886); Lawson, Bull. Torr. Bot. Cl. xiv. 10 (1887); Vroom, ibid. 12 (1887); Chickering, Bot. Gaz. xiii. 322 (1888), in part; not L.— Plant 1–4 dm. high, simple or more or less branched; branches long, spreading or arcuate-ascending: leaves ovate-oblong, glabrous, the primary 0.5–2 cm. long, coarsely toothed; teeth acute or obtuse: spikes rather short, except in full fruit, occupying the ends of the stems and branches, in maturity becoming 3–15 cm. long: bracts 5–18 pairs, glabrous, conspicuous, broadly ovate, more or less spreading, coarsely aristate-toothed, the lowest in maturity 0.5–2 cm. apart: flowers medium to large: corolla pale, 7–10 mm. long; upper lip tinged with purple, shallowly bilobed, the lobes partly reflexed, each 2–3-toothed; lower lip large, white with dark-purple lines, fan-shaped, the lateral lobes wide-spreading.— The commonest *Euphrasia* throughout southeastern Maine, the Maritime Provinces, and Newfoundland, rarely found far away from habitations. Newfoundland: fields and roadsides, Killigrew's, August 3, 1911, *Fernald & Wiegand*, no. 6176; dry roadsides and pastures, Carbonear, August 6 and 7, 1911, *Fernald & Wiegand*, no. 6177; roadsides and dry clearings, Whitbourne, August 8, 1911, *Fernald & Wiegand*, no. 6178; Clarenville, July 18, 1902, *L. L. Dame;* Fogo Island, August 7, 1903, *J. D. Sornborger;* grassy shore of Dildo Run, New World Island, July 17, 1911, *Fernald, Wiegand & Bartram*, no. 6174; Glenwood, July 12 and 13, 1911, *Fernald, Wiegand & Darlington*, no. 6172; ledges, talus and gravel, north bank of Exploits River, below the falls, Bishop Falls, July 28, 1911, *Fernald, Wiegand & Darlington*, no. 6175; gravelly railroad bank near Rushy Pond, July 15, 1911, *Fernald, Wiegand & Bartram*, no. 6173; alluvium of brook, Quarry, August 23, 1911, *Fernald & Wiegand*, no. 6179; Grand Lake, July 25–August 15, 1906, *Owen Bryant;* grassy fields, Cow Head, July 23, 1910, *Fernald & Wiegand*, no. 3984; railway gravel near Bay of Islands station, July 18, 1910, *Fernald, Wiegand & Kittredge*, no. 3981; damp pastures, Birchy Cove (Curling), August 10, 1910, *Fernald, Wiegand & Kittredge*, no. 3989; open moist and grassy to dry and sterile places, Bay of Islands, August 10, 1908, *Eames & Godfrey*, no. 8063; fields, Doyle's, Great Codroy River, July, 1912, *J. R. Lunt;* field near coast, Channel, July 27–August 1, 1901, *Howe & Lang*, no. 789. Quebec: sterile soil, western end of Bonaventure Island, August 7 and 8, 1907, *Fernald & Collins*, no. 1165; fields and tops of sea-cliffs, Paspébiac, July 26, 1902, *Williams & Fernald;* sandy grassland, New Carlisle, July 28, 1902, *Williams & Fernald.* Magdalen Islands: dry sandy summit of Great Bird Rock, August 7, 1914, *St. John*, no. 1645; dry sandy headlands, Brion Island, August, 1914, *St. John*, nos. 1643, 1644;

open fields and recent clearings, Grindstone, Grindstone Island, July 22 and August 13, 1912, *Fernald, Long & St. John*, no. 8024, 8026. Prince Edward Island: dry sandy roadsides and fields, Tignish, August 6, 1912, *Fernald, Long & St. John*, no. 8025; Royalty Junction and Summerside, July, 1901, *J. R. Churchill;* among grass, East Point, August 15, 1888, *J. Macoun*, Herb. Geol. Surv. Can., no. 17,439; grassy places, Union Road, August, 1888, *J. Macoun*, Herb. Geol. Surv. Can., no. 17,444. Nova Scotia: McDonald's, Dingwall, Aspy Bay, July 14, 1909, *J. R. Churchill;* Sydney, July 17, 1902, *G. H. Morris;* common in grassland, Sydney, August, 1902, *Fernald;* Big Intervale, Cape Breton Island, July, 1898, *J. Macoun*, Herb. Geol. Surv. Can., no. 19,896; Barrington Passage, July, 1910, *J. Macoun*, Herb. Geol. Surv. Can., nos. 80,661, 80,664; Canso, August 2, 1901, *J. Fowler;* dry field, Sunny Brae, July 28, 1913, *St. John*, no. 1447; thin soil, Black Hole, near Baxter's Harbor, Scott's Bay, August 24, 1902, *Fernald;* sandy soil, Vault Road, North Mountain, near Sheffield's Mill, August 24, 1902, *Fernald;* dry soil, roadside, Windsor Junction, July 11, 1901, *Howe & Lang*, no. 433; Bridgewater, July, 1910, *J. Macoun*, Herb. Geol. Surv. Can., nos. 80,658, 80,659; rocks, Bell's Island, August 10, 1910, *J. Macoun*, Herb. Geol. Surv. Can. no. 80,662; Cape Sable Island, June 30, 1910, *J. Macoun*. Herb. Geol. Surv. Can., no. 80,656. New Brunswick: thin grassland, Bathurst, July 23, 1902, *Williams & Fernald;* grassy roadside, Bathurst, August 13, 1913, *S. F. Blake*, no. 5368; sphagnum bog, Grande Anse, August 22, 1913, *Blake*, no. 5526; pasture, Miscou Harbor, August 26, 1913, *Blake*, no. 5543; St. John, *Wm. Boott* (August 8, 1873) *et al.;* St. Andrews, August, 1900, *J. Fowler;* Campobello Island, 1902, *W. G. Farlow;* Grand Manan Island, 1902, *W. G. Farlow*. Maine: open grassland, New Limerick, August 13, 1909, *Fernald*, no. 2114; slaty bank 1 mile above Oldtown, August 2, 1908, *Fernald;* gravelly open soil, Princeton, July 22, 1909, *Fernald*, no. 2117; Passamaquoddy Bay, August, 1892, *F. L. Harvey;* Moose Island, Passamaquoddy Bay, August, 1909, *Fernald*, nos. 2116, 2118, 2119; dry soil, Pleasant Point, Perry, August, 1909, *Fernald;* Cross Island, August, 1902, *Kate Furbish;* Cutler, August, 1902, *Kate Furbish;* roadside, Marshfield, July 8, 1902, *Fernald;* mossy roadside in woods between East Machias and Cutler, July 16, 1901, *G. G. Kennedy;* roadside, East Machias, July 23, 1910, *C. H. Knowlton;* Machias, August, 1888, *J. W. Chickering;* Black Island, July 20, 1894, *J. H. Redfield;* grassland, Great Cranberry Island, *Faxon & Rand* (1894) *et al.;* Sea Wall, Mt. Desert Island, 1891 and 1892, *Rand;* moist spots on roadsides, Brooklin, July 22, 1912, *A. F. Hill*, no. 234.

Wettstein's *Euphrasia americana* was a complex, consisting of the *E. officinalis* of Pursh's *Flora*, of specimens from St. John, New Brunswick (*Matthew*) and Quebec (*Canby*), and some material labeled "Flor. Am. bor." (Hooker). The *E. officinalis* of Pursh's *Flora* was

Michaux's plant from Quebec, which is *E. canadensis;* the Canby material from Quebec was presumably also *E. canadensis,* the common plant in the neighborhood of Quebec; but the St. John specimen, the first mentioned, therefore the type, and also the plant illustrated by Wettstein, is characteristic of the species here taken up as *E. americana.*

E. americana, like *E. canadensis* and *E. stricta,* has the appearance of an introduced plant, being extremely weed-like and inhabiting fields, pastures, roadsides and other artificial habitats in the neighborhood of civilization. The earliest collection seen by us was made by William Boott at St. John, New Brunswick, in 1873. Since then the species has been found in seemingly increasing abundance throughout the coastal districts of the Maritime Provinces, Newfoundland and Maine, closely following the progress of civilization into the interior of Newfoundland. In 1885, in making what seems to be the first clear record of the plant in Maine (though *E. stricta* may have been included), Redfield listed it among "recent introductions" (Bull. Torr. Bot. Cl. xii. 103) and in 1886 again wrote of it as "an introduced plant" (*ibid.* xiii. 232). But in 1887, Lawson, noting the wide distribution in Nova Scotia of the plant, said: "I know of no reason for regarding our common Canadian form otherwise than as indigenous" (Bull. Torr. Bot. Cl. xiv. 10) and at the same time (p. 12) Vroom, noting the plant about the ports of New Brunswick, said: "Though regarded here as a native, its being most frequent near the older settlements would seem to favor the opinion that it has been introduced." In publishing the species, Wettstein suggested the possibility of its being a modern derivative from the European *E. nemorosa;* but *E. americana* is at once distinguished by its larger flowers. Its affinity, it seems to us, is more with *E. stricta,* but ordinarily *E. americana* is readily separated from that species by the shorter spikes and more spreading bracts. From *E. canadensis* it is distinguished by its larger corollas with usually darker lines and its proportionally shorter spikes.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—NEW SERIES, NO. XLV.

Presented by B. L. Robinson, June 17, 1915. Received June 17, 1915.

I. COMPOSITAE NEW AND TRANSFERRED, CHIEFLY MEXICAN.

By S. F. Blake.

Sericocarpus bifoliatus (Walt.) Porter var. **Collinsii** (Nutt.) Blake, n. comb.— *Aster Collinsii* Nutt.! Journ. Acad. Nat. Sci. Philad. vii. 82 (1834). *Sericocarpus Collinsii* Nutt. Trans. Am. Philos. Soc. ser. 2. vii. 302 (1841). *Sericocarpus tortifolius* (Michx.) Nees var. *Collinsii* (Nutt.) Torr. & Gray, Fl. N. Am. ii. 103 (1841).— Nuttall's type in the British Museum, collected by Ware in eastern Florida, has obovate leaves, 3–5-toothed above the middle, but is indistinguishable in any other character from the ordinary form of the species. So noteworthy a variation, although not recognized by Dr. Gray in the Synoptical Flora, seems to merit varietal rank.

Sericocarpus rigidus Lindl. var. **californicus** (E. Dur.) Blake, n. comb.— *Sericocarpus californicus* E. Durand! Journ. Acad. Nat. Sci. Philad. (Pl. Pratt.) ser. 2. iii. 90 (1855).— All the Californian specimens of *Sericocarpus rigidus* examined, including the type of *S. californicus* in the herbarium of the Muséum d'Histoire Naturelle at Paris, collected near Nevada City by Rattan, differ from the nearly glabrous northern forms of the species in their more or less densely short-hispid-pilose stems, and appear to constitute a well defined geographical variety.

Gymnolomia **obscura** Blake, n. sp. Annua tenuis erecta sursum parce ramosa 1.9–3.5 dm. alta. Caulis leviter striatus hispidulus et strigosus pallide brunneus. Folia inferiora (3–7-juga) opposita superiora alterna oblongo-ovata vel oblongo-lanceolata vel lanceolata acuta vel subacuminata basi cuneata crenato-dentata (dentibus ca. 7–9-jugis appressis rotundatis) vel superiora integra supra viridia subdense tuberculato-strigosa subtus distincte pallidiora subsparse strigoso-hispida (pilis venas secundum longioribus) et sparse glanduloso-adspersa triplinervia 2.7–4.7 cm. longa 9–13 mm. lata, petiolis vix marginatis patenti-hispido-pilosis 3–5 mm. longis; ea inflore-

scentiae multo reducta bracteiformia. Capitula 6–9 parva (2 cm. lata) in pedunculis axillaribus et terminalibus 2.3–8.5 cm. longis monocephalis nudis vel bracteatis interdum etiam (vix normaliter) ex axillis inferioribus orientibus insidentia. Discus 6.5 mm. altus 7 mm. crassus maturitate valde convexus. Involucri 2-seriati vix gradati 3.5–5 mm. alti squamae herbaceae praecipue superne hispido-pilosae lanceolatae vel ovatae (tum supra mediam partem abrupte angustatae acuminatae) acutae mucronulatae rarius obtusae. Radii ca. 6 flavi neutrales oblongi emarginulati dorso minute strigillosi 7 mm. longi 3.5 mm. lati. Corollae disci flavae 1.6–1.9 mm. longae (tubo glanduloso basi non ampliato 0.5 mm. longo). Paleae receptaculi valde convexi subhyalino-scariosae in carina sursum et apice virides-centes supra sparse breviter pilosae et ciliatae apice abrupte acutae mucronulatae 3.3 mm. longae. Achaenia oblongo-obovoidea parum incrassata glabra striata albido-nigro-maculosa 2 mm. longa 1 mm. lata. Pappus nullus.— VERA CRUZ: Maltrata, Jan. 1883, *Kerber* 211 (TYPE COLL.: Brit. Mus., Kew). Vernacular name "Acaguale." — Distributed as a *Scleropus* (i. e. *Sclerocarpus*) under an unpublished name attributed to Schultz Bipontinus, which as originally used by Schultz can have had no application to the specimens. The species comes near *G. longifolia* and *G. annua* Rob. & Greenm., but is distinct in its short involucre.

GYMNOLOMIA **hypochlora** Blake, n. sp. Herbacea alta erecta supra ramosa. Caulis tenuis purpurascens striatulus hispidulo-strigillosus. Folia (saltem media et superiora) alterna lanceolata vel oblongo-lanceolata acuminata basi cuneata obscure serrulata (dentibus ca. 11-jugis appressis) ca. 1–1.5 cm. supra basin valde trinervia reticulata supra viridia tuberculato-strigosa aetate lepidota subtus non pallidiora venas et venulas secundum hispidula inter venas plus minusve glandulari-granulosa 8–13.5 cm. longa 1.7–2.7 cm. lata. Petioli hispido-piloso-ciliati 3 mm. longi. Capitula ca. 11 apice caulis laxe cymoso-paniculata 3.5 cm. lata, pedunculis striatis sparse tuberculato-strigillosis nudis vel 1–2-bracteolatis 5–13 cm. longis. Discus 1–(fructu) 1.4 cm. altus 1.4–(fructu) 1.9 cm. crassus. Involucri 5-seriati gradati discum superantis squamae serierum 3 exteriorum herbaceae lanceolatae vel oblongo-lanceolatae acuminatae plus minusve involutae nigrescenti-virides hispido-piloso-ciliatae et intus strigillosae basi induratae apice valde reflexae, eae serierum interiorum oblongae obtusae vel obtusiusculae apice submembranaceo maturitate elongato discum superantes ciliolatae infra paullum induratae plus minusve strigillosae. Radii 12 neutrales flavi oblongi 1.5 cm. longi

4 mm. lati. Corollae disci flavae in basi tubi ampliata etiam basi faucium puberulae 5.5 mm. longae (tubo 1.2 mm.). Paleae supra purpurascentes et strigillosae apice abrupte acuminatae 6.8 mm. longae. Achaenia glabra substriata oblonga 3 mm. longa 1 mm. lata. Pappus nullus.— JALISCO: mountains above Etzatlan, 2 Oct. 1903, *Pringle* 11537 (TYPE COLL.: Kew).— Distributed as *G. Ghiesbreghtii* Hemsl., but that has mainly opposite leaves whitened beneath with a dense strigillosity.

Haplocalymma Blake, n. genus *Helianth.-Verbesin., Hymenostephio* Benth. proximum, a quo involucro uniseriato 5-phyllo et foliis alternis imprimis differt.— Capitula heterogama radiata, floribus radii neutris disci hermaphroditis fertilibus. Involucri subcampanulati bracteae 5 uniseriatae oblongo-lanceolatae acuminatae adpressae apice paullum patentes subherbaceae intus subinduratae 3–5-nerviae dense strigosae flores radii subtendentes. Receptaculum parvulum convexiusculum, paleis complicatis flores disci amplectentibus onustum. Corollae radii 5 ligulatae flavae parvae ovales ca. 6-nerviae emarginatae; disci ca. 16 regulares flavae puberulae tubo brevissimo faucibus cylindricis apice 5-fidae. Antherae basi subauriculatae apice appendice deltoideo-ovata flava munitae. Styli rami obtusiusculi hirti non appendiculati. Achaenia radii abortiva; disci parva oblonga a latere subcompressa subsparse villosa. Pappus e squamellis 6 hyalinis latis profunde laceratis duabus in angulis achaenii paullo longioribus compositus.— Herba ramosa tenuis strigillosa, capitula numerosa parvula in paniculis cymosis subdensis 3–5-cephalis ramos dichotome ramosos terminantibus gerens. Folia (saltem media et superiora) alterna ovata grosse sinuato-dentata dentibus acutissime mucronatis.— Species unica *Viguiera microcephala* Greenm.

HAPLOCALYMMA **microcephalum** (Greenm.) Blake, n. comb.— *Viguiera microcephala* Greenm.! Proc. Am. Acad. xxxix. 105 (1903).— MORELOS: limestone hills near Yautepec, 7 Nov. 1902, *Pringle* 8717 (TYPE COLL.: Brit. Mus., Kew); near Cuernavaca, 1905, *Lemmon* 85 (Kew).

The genus *Haplocalymma* (ἁπλοῦς, *simple*, and κάλυμμα, *covering*, from the uniseriate involucre) differs from its near ally *Hymenostephium* Benth. of southern Mexico, Central America and Colombia in its strictly uniseriate 5-leaved involucre (of 2–3 series in *Hymenostephium*) and its alternate leaves, but in pappus characters agrees perfectly with *Hymenostephium angustifolium* Benth. From *Viguiera*, to which its relationship is rather less close, it may be distinguished by the character of its pappus and involucre. The group of *Viguiera*

most nearly approaching it, including *V. tenuis* Gray and *V. gracillima* Brandegee, has the phyllaries 2–sub-3-seriate and distinctly more numerous, while the pappus is typical of that of *Viguiera*, consisting of two slender awns sharply differentiated from the four to six shorter squamellae.

VIGUIERA **adenophylla** Blake, n. sp. Herbacea supra ramosa ramis erectis. Caulis purpureo-brunneus plus minusve glanduloso-puberulus sursum appresse pilosulus subflexuosus. Folia alterna late ovata acuminata basi cuneata vel abrupte truncata in petiolum cuneate angustata crenato-dentata (dentibus 17–21-jugis depresso-deltoideis mucronatis) apice acuminato integro trinervia supra subappresse pilosula (pilis basi glandularibus vix tuberculatis) infra non pallidiora glandulosa pilosula 8.5–10.5 cm. longa 4.6–7 cm. lata. Petioli glandulari-pubescentes 1.8–2 cm. longi. Capitula ca. 26 cymoso-paniculata 2.8 cm. lata. Discus 8–13 mm. altus 7–10 mm. crassus. Involucri 6 mm. alti biseriati subgradati squamae lanceolatae vel ovato-lanceolatae acutae subherbaceae basi plus minusve induratae costatae in margine et plus minusve dorsaliter sordide albido-pilosiusculae et glandulosae. Radii 8 flavi ovales emarginati in venis dorsi puberuli 10–12 mm. longi 5.5–6 mm. lati. Corollae disci flavae subappresse pilosulae 6 mm. longae (tubo 1.3 mm.) faucibus campanulato-infundibuliformibus. Paleae oblongae mucronatae acutae margine flavidae apice eroso-denticulatae dorso sordide pilosiusculae parce glandulosae 8–9 mm. longae. Achaenia (immatura) sericea. Aristae 2 paleaceae oblongo-lanceolatae acutae vel obtusae fimbriatae inaequales 2.8–3.5 mm. longae; squamellae 4 longiores liberae oblongae lacerato-fimbriatae ca. 1.2 mm. longae et ca. 4 parvae intermediae laceratae.— SAN LUIS POTOSI: alt. 1830–2440 m., 1878, *Parry & Palmer* 467 (TYPE COLL.: Brit. Mus., Gray Herb., Kew).— Not closely related to any other species.

VIGUIERA **angustifolia** (H. & A.) Blake, n. comb.— *Tithonia pachycephala* H. & A. ! Bot. Beech. Voy. 299 (1840), not DC. (err. iden.). *T. angustifolia* H. & A. ! l. c. 435 (1841). *Viguiera blepharolepis* Gray! Proc. Am. Acad. xix. 5 (1883).— The type of *Tithonia angustifolia* H. & A. (Tepic, *Sinclair*, hb. Kew.) is identical with *Seemann* 1481, from Cerro de Pinal, type collection of *V. blepharolepis*, and not at all the same as *V. buddleiaeformis* (DC.) B. & H. f., although considered by Bentham (B. & H. f. Gen. ii. 375 (1873)) to be identical with the latter species. The only previous *Viguiera angustifolia*, that of Glaziou, Mém. Soc. Bot. France, iii. 412 (1910), is merely a nomen nudum.

VIGUIERA **bicolor** Blake, n. sp. Frutex ramosus verosim. ad 1 m. altus. Ramuli juniores canescenti-strigillosi seniores cano-brunnei subglabrati. Folia subopposita vel superiora alterna rotundata vel rotundato-ovata apice retusa vel rotundata vel obtusa basi truncato-rotundata trinervia supra (siccitate) nigro-viridia aspere strigillosa subtus densissime griseo-strigillosa venosa 1.2–1.8 cm. longa 8–18 mm. lata margine plus minusve revoluta. Petioli canescenti-strigillosi 5–7 mm. longi. Capitula solitaria ramulos terminantia 1.8 cm. lata. Pedunculi canescenti-strigillosi 2.8–4.3 cm. longi. Discus 6–7 mm. altus 11–12.5 mm. crassus. Involucri 3-seriati 3–4 mm. alti gradati squamae acutae densissime strigillosae exteriores oblongae 0.8 mm. latae interiores oblongo-ovatae 2 mm. latae. Radii ca. 12 flavi oblongo-ovales in dorso et tubo dense puberuli 6.5 mm. longi 3 mm. lati. Corollae disci flavae puberulae 3 mm. longae (tubo 0.5 mm.). Paleae subobtusae dorso et apice puberulae 5 mm. longae. Achaenia (immaturissima) subsericea 2.5 mm. longa. Aristae 2 inaequales ad 1.2 mm. longae; squamellae ca. 6–8 acutae inaequales laciniatae multo breviores.— HIDALGO (?): between Rio Grande and Jamaltepec (?), Dec. 1829, *C. Ehrenberg* 1227 (TYPES in the Berlin Herb. and the Gray Herb.).— From its nearest ally, *V. brevifolia* Greenm., the present species differs chiefly in foliar characters. The leaves of *V. brevifolia* are ovate to triangular-ovate, usually acute but sometimes obtuse, and usually strongly canescent above, on petioles 2–3 mm. long; the awns of the pappus about 1 mm. long, equalling the squamellae. Ehrenberg's plant in the Berlin Herbarium was marked as a new species under an unpublished generic name equivalent to *Gymnolomia* by Schultz Bipontinus, who could scarcely have given it more than a very casual inspection to refer it to this genus the salient character of which is the absence of pappus.

VIGUIERA **Brandegei** Blake, n. nom.— *Aspilia hispida* Brandegee! Univ. Calif. Pub. Bot. iv. 94 (1910), not *Viguiera hispida* Baker in Mart. Fl. Bras. vi. pt. 3. 220 (1884).— The pappus of this species, of about 4 oblong irregularly lacerate squamellae with 1 or 2 longer similar aristae, is that of *Viguiera* rather than *Aspilia*. Among Mexican species *V. Brandegei* is most closely related to *V. tenuis* Gray and *V. gracillima* Brandegee. The species is renamed in honor of its original describer, whose publications have for many years been adding largely to our knowledge of the flora of Mexico and Lower California.

HELIANTHUS **leptocaulis** (Wats.) Blake, n. comb.— *Viguiera leptocaulis* Wats. ! Proc. Am. Acad. xxvi. 140 (1891).— Watson's

Viguiera leptocaulis, the type of which (*Pringle* 2247, from near Monterey) was examined at the Gray Herbarium by the writer some months ago, in its involucre, wholly deciduous pappus, and general habit agrees much better with the genus to which it is here referred than with that in which it was originally placed. It seems quite distinct from any described Mexican *Helianthus*.

Phoebanthus Blake, n. genus *Helianth.-Verbesin.* — Capitula heterogama radiata, floribus radii 1-seriatis neutralibus disci hermaphroditis fertilibus. Involucrum hemisphaericum, bracteis 3-seriatis vix gradatis eis duarum serierum exteriorum lineari-lanceolatis acuminatis infra valde induratis costatis supra appendice herbacea laxa multo longiore praeditis sparse tuberculati-hispidis eis seriei intimae latioribus brevioribus solummodo acutis apice obscurissime subherbaceis appressis flores radii subtendentibus. Receptaculum convexum, paleis complicatis flores disci amplectentibus. Corollae radii ligulatae patentes anguste oblongae apice 2–3-denticulatae; disci regulares tubulosae, tubo brevi faucibus elongatis cylindraceis apice breviter 5-fidae. Antherae basi valde sagittatae apice appendice ovali vel oblongo-ovata obtusa munitae, filamentis vel in tubum clausum connatis vel liberis. Styli florum disci rami lineares elongati hirti appendice lineari-oblonga hirta muniti. Achaenia radii trigona abortiva; disci subglabra valde incrassata subquadrangularia (attamen a latere plus minusve compressa) in angulis submarginata. Pappus ex aristis 2 interdum basi profunde laceratis tenuibus vel subpaleaceis persistentibus interdum ad dentes reductis et squamellis numerosis minutis intermediis compositus.— Herbae perennes e radice tuberiformi horizontali submoniliformi. Caulis tenuis simplex 1–3-cephalus foliosus 3–4-pedalis. Folia linearia alterna (paucis inferioribus oppositis exceptis) integra 1-nervia paullum revoluta plus minusve tuberculato-strigosa. Capitula magna flava. Flores radii 10–20 pollicares et ultra; disci numerosi.— Species typica *Helianthella grandiflora* Torr. & Gray.— *Helianthus* L. subgen. *Pseudo-helianthus* Gray, Syn. Fl. i. pt. 2. 285 (1884).

1. Phoebanthus **grandiflorus** (Torr. & Gray) Blake, n. comb.— *Helianthella grandiflora* Torr. & Gray, Fl. N. Am. ii. 333 (1842).

2. Phoebanthus **tenuifolius** (Torr. & Gray) Blake, n. comb.— *Helianthella tenuifolia* Torr. & Gray, Fl. N. Am. ii. 333 (1842).

The two species of *Phoebanthus* (Φοῖβος, *Phoebus*, the sun, and ἄνθος, *flower*) form a small group very similar to *Helianthus* in habital characters, but technically more closely allied to *Helianthella*. From the former *Phoebanthus* differs sufficiently in the numerous short

persistent squamellae united into a low denticulate crown, from the latter in habit and achenial characters, as also in range, the species of *Helianthella* being West American and Mexican, of *Phoebanthus* Floridan. The species of *Helianthella*, which after the exclusion of *Enceliopsis* and *Pseudo-helianthus* of the Synoptical Flora are restricted to the subgenus "*Helianthella* proper" of that work, are perennial herbs with rather few lanceolate to oblong-lanceolate usually ample leaves, alternate or opposite, of which the basal are generally much larger, phyllaries for the most part herbaceous or often enlarged and foliaceous, and achenes very strongly flattened (as in *Encelia*), on the margin villous or glabrate, with 2 longer or shorter awns and a corona of thin squamellae of varying length, united below or distinct to the base.

Although the genus *Helianthella* on its first publication (Torr. & Gray, l. c.) was divided into two groups, of which the first (§1, without name) contained only the two species here referred to *Phoebanthus*, while the second had three species (*H. Douglasii*, *H. lanceolata*, and *H. uniflora*) all still retained in *Helianthella*, I have not thought it advisable to consider the *H. grandiflora* group as typical, on the ground of priority of position, and to create a new name for the second group, both because a considerably greater number of name changes would be involved and because the *H. Douglasii* group was considered by Gray himself (see Proc. Am. Acad. xix. 9 (1883); Syn. Fl. i. pt. 2. 284 (1884)) as typical of the genus.

Pionocarpus Blake, n. genus *Helianth.-Verbesin.*— Capitula heterogama radiata, floribus radii 1-seriatis neutralibus disci hermaphroditis fertilibus. Involucrum hemisphaericum, bracteis 2-seriatis (exterioribus paullulo brevioribus) anguste ovato-lanceolatis acuminatis herbaceis subcostatis plus minusve piloso-hispido-ciliatis. Receptaculum convexum, paleis complicatis acuminatis flores disci amplectentibus onustum. Corollae radii ligulatae patentes oblongae; disci regulares, tubo brevissimo faucibus cylindraceis limbo 5-dentato. Antherae basi cordato-sagittatae apice appendice ovata obtusa praeditae. Styli rami lineares hirti appendice lineari-lanceolata longa hirtella praediti. Achaenia radii inania; disci oblonga pubescentia apice truncata valde incrassata paullum a latere compressa immarginata. Pappus persistens ex aristis 2 subaequalibus subtenuibus et squamellis ca. 10 multo minoribus laceratis basi ima unitis interdum una duabusve elongatis compositus.— Herba perennis subscaposa e radice verticali crassa tuberiformi. Caulis parcissime ramosus ca. 4-cephalus. Folia maxima ex parte radicalia lineari-lanceolata

utrimque acuminata longe petiolata subintegra caulina 3–4 (infra mediam partem caulis). Capitula majuscula longe pedunculata, pedunculis basi unibracteatis. Flores radii ca. 10 flavi, disci numerosi flavi.— Species unica *Helianthella madrensis* Wats.

PIONOCARPUS **madrensis** (Wats.) Blake, n. comb.— *Helianthella madrensis* Wats.! Proc. Am. Acad. xxiii. 278 (1888).— CHIHUAHUA: pine plains, base of the Sierra Madre, 19 Sept. 1887, *Pringle* 1302 (TYPE COLL.: Kew).

The genus *Pionocarpus* (πιών, fat, and καρπὸς, fruit) is distinguished from *Helianthella* chiefly by characters of the achene and style. The achenes of *Pionocarpus* are strongly thickened, unmargined, and broadly truncate at apex, and the style-branches bear a long hirtellous appendage. In *Helianthella,* on the contrary, the achenes are very flatly compressed, as in *Encelia,* are more or less distinctly white-margined, and at the true apex are much narrower than the body, the more or less united squamellae being borne in a notch at the summit of the achene between the two awns. From *Phoebanthus,* to which its relationship is rather closer, *Pionocarpus* is separated by its habit and by the much more conspicuous squamellae.

PERYMENIUM **blepharolepis** Blake, n. sp. Frutex ramosus. Caulis densissime strigillosus cortice cano-brunneo tectus aetate glabratus; rami tenues subquadrangulares strigillosi fusco-brunnei. Folia opposita ovata subacuminata basi cuneata vel cuneato-rotundata trinervia appresse serrata (dentibus 7–8-jugis) supra viridia strigillosa pilis basi tuberculatis subtus pallidiora non canescentia strigosa et strigillosa plus minusve glanduloso-adspersa 2.5–3.8 cm. longa 10–17.5 mm. lata. Petioli tuberculato-strigosi 2 mm. longi. Capitula 1.5–2 cm. lata in apicibus ramorum 5–7 sublaxe cymoso-paniculata in pedunculis axillaribus et terminalibus strigillosis 1.2–4.5 cm. longis. Discus 7–9.5 mm. altus 6–8 mm. crassus. Involucri 3–sub-4-seriati gradati 7 mm. alti squamae exteriores ovatae interiores ovato-lanceolatae plus minusve strigillosae et ciliatae infra subinduratae pallidae ca. 5-nerviae apice laxo angustato subacuto herbaceo. Radii 8 fertiles aurei oblongo-ovales bidenticulati in venis dorso plus minusve puberuli 7–5 mm. longi 3 mm. lati. Corollae disci aureae in dentibus hirtellae 4.8–5 mm. longae (tubo 1.4–1.5 mm.). Paleae obtusae supra strigillosae in margine et carina spinuloso-ciliolatae 5.8–7 mm. longae. Achaenia juventate plus minusve piloso-hispida maturitatem vergentia sparse hispidula. Pappi aristae ca. 12 caducae ad 1.3 mm. longae subaequales (2 longioribus 3 mm. longis exceptis).— PUEBLA: Coxcatlan, alt. 2135–2440 m., Sept. 1909, *Purpus* 4143

(TYPE COLL.: British Museum).— Most nearly related among described species to *P. verbesinoides* DC., but distinct in its longer looser phyllaries, fewer longer-peduncled heads, and in its distinctly paler leaves, which are much less reticulate beneath.

PERYMENIUM **hypoleucum** Blake, n. sp. Frutex ramosus. Caulis strigillosus cortice griseo-brunneo tectus aetate subglabratus; rami sub-6-angulares subdense strigillosi purpureo-brunnei. Folia opposita (paucis superioribus interdum alternis exceptis) ovata vel elliptico-ovata obtusa vel acuta basi cuneato-rotundata serrata (dentibus 5–7-jugis late triangularibus subpatentibus vel appressis) pinnatinervia (venis supra impressis subtus reticulatis majoribus 3–4-jugis imis validioribus) supra viridia dense strigosa pilis basi tuberculatis subtus cum pilis densissimis appressis brevibus canescentia et subaspera 2–3 cm. longa 1.1–1.9 cm. lata. Petioli strigosi immarginati 1.5–2 mm. longi. Capitula 1 cm. lata ad apices ramorum 4–10 dense cymoso-paniculata in pedunculis dense strigosis 3–8 mm. longis disposita. Discus 6–8 mm. altus 5–7 mm. crassus. Involucri 4-seriati gradati 4 mm. alti squamae solummodo apice herbaceae infra induratae pallidae dense strigillosae obtusae vel rotundatae extimae elliptico-ovatae interiores deltoideo-ovatae vel late ovales intimae 3-nerviae. Radii fertiles ad 7 ovales aurei 2–3-denticulati in venis dorso hirtelli 3.5 mm. longi 2 mm. lati. Corollae disci flavae in dentibus et interdum tubo hirtellae 3.5 mm. longae (tubo 1 mm.). Paleae in carina infra glandulosae supra subspinulosae in margine denticulato-spinulosae apice abrupte acutae 3.7 mm. longae. Achaenia (immaturissima) in angulis hispidula. Pappi aristae ca. 8 caducae spinulosae subaequales (una duabusve duplo longioribus exceptis).— PUEBLA: vicinity of San Luis Tultitlanapa, near Oaxaca, 9 July 1908, *Purpus* 3087 (TYPE COLL.: British Museum).— Distributed as *P. rude* Rob. & Greenm., from which it is very distinct. More closely related to *P. croceum* Rob. & Greenm. and *P. angustifolium* Brandegee, but quite distinct from both.

PERYMENIUM **leptopodum** Blake, n. sp. Frutex ramosus. Caulis tenuis quadrangularis minute strigillosus cortice brunneo vel purpureo-brunneo tectus. Folia opposita ovato-lanceolata acuminata basi cuneata trinervia appresse serrata (dentibus 8–10-jugis) supra obscure viridia minute strigilloso-scabra subtus non pallidiora glanduloso-adspersa venas et venulas secundum strigillosa 4.6–6.3 cm. longa 1.5–2.3 cm. lata. Petioli vix marginati tenues 9–16 mm. longi. Capitula 1.6 cm. lata in apicibus ramorum et ramulorum ternatim vel quinatim cymoso-paniculata. Pedicelli 5–19 mm. longi strigillosi.

Discus 5–7 mm. altus 4–6 mm. crassus. Involucri 3-seriati 4 mm. alti paullum gradati squamae extimae breviores late ovatae obtusae strigillosae vix ciliolatae basi coriaceo-induratae apice herbaceae mediae et intimae late oblongae subobtusae minus induratae ciliolatae et strigillosae apice subherbaceae. Radii 8 fertiles flavi ovales bidenticulati dorso glanduloso-puberuli 4.5–5.8 mm. longi 2.8 mm. lati. Corollae disci flavae in tubo puberulae 3–4.2 mm. longae (tubo 0.6–1.6 mm.), faucibus valde ampliatis. Paleae subacutae scariosae flavae in carina hispidulae margine superne lacerato-dentatae 4.2–4.6 mm. longae. Achaenia brunneo-nigrescentia transverse plus minusve rugulosa incrassata submarginata apice rotundata sparse strigillosa 1.8 mm. longa 1 mm. lata. Pappus fragilissimus ex aristis 2 tenuibus spinulosis 2.5 mm. longis et aristulis ca. 12 inaequalibus (longioribus ad 1 mm. longis) compositus.— GUATEMALA: shrubby growth, alt. 1311 m., near Coban, Jan. 1879, *von Tuerckheim* 339 (TYPE COLL.: British Museum, Kew).— This number is referred in Robinson & Greenman's revision (Proc. Am. Acad. xxxiv. 526 (1899)) to *P. gymnolomioides* (Less.) DC., originally described from Vera Cruz, but differs in several important features from the description there given of that species, which is said to have entire leaves, 3–5-headed corymbs, spreading-pubescent pedicels, and much shorter petioles (3 mm. long).

CHRYSACTINIA **acerosa** Blake, n. sp. Frutex ramosus pedalis. Caulis tenuis brunneo-griseus minute hirtellus aetate glabratus oppositе ramosus. Folia opposita vel superiora alterna filiformi-subulata 2–4-glanduloso-punctata semiteretia supra complanata apice subulato-mucronata glabra laete viridia 6–8 mm. longa 0.25 mm. lata saepius ramulos brevissimos foliosissimos subtendentia. Pedunculi ramos terminantes monocephali glandulari-hirtelli lineari-subulato-bracteolati striati ad 1 cm. longi. Capitula (immatura) hemisphaerica 5–6 mm. alta. Involucri uniseriati 3.5 mm. alti squamae aequales 8 anguste oblongae (0.8–1.3 mm. latae) membranaceo-chartaceae virides centes obtusae subcarinatae in margine scarioso sparse erosociliatae infra apicem glandula anguste oblonga brunnea praeditae. Radii (immaturi) aurei oblongi fertiles. Corollae disci (immaturae) aureae in dentibus minute hirtellae 4 mm. longae. Achaenia (immaturissima) pubescentia. Aristae pappi ca. 24 tenues spinulosae subaequales ad 3.5 mm. longae.— SAN LUIS POTOSI: Sierra de Guascama, Minas de San Rafael, June 1911, *Purpus* 5136 (TYPE COLL.: British Museum, Gray Herb., U. S. Nat. Herb.).— Distributed as a narrow-leaved form of *C. mexicana* Gray, but seemingly quite distinct from that species in foliar and involucral characters.

The four species of *Chrysactinia* now known may be conveniently divided into two sections, habitally well marked but without differential characters of technical importance.

I. CHRYSACTINIA Gray (Pl. Fendl. 93 (1849)) sect. **Euchrysactinia** Blake, n. sect. Folia subulata integerrima. Corollae radii discique aureae.— Type *C. mexicana* Gray.

1. C. MEXICANA Gray, l. c. (1849).— Leaves subulate, flattened above, hirtellous on the margin, mostly alternate, 4.5–12 mm. long, 0.7–1.2 mm. wide, with rather numerous glands. Phyllaries apparently uniformly 12 in number, 4–5 mm. long.— *Pectis taxifolia* Greene! Leafl. i. 148 (1905): see Greenm. Field Columb. Mus. Bot. ii. 274 (1907).— Western Texas and New Mexico to Puebla.

2. C. ACEROSA Blake.— Leaves filiform-subulate, glabrous, mostly opposite, bearing 2–4 glands, 6–8 mm. long, 0.25 mm. wide. Phyllaries 8 in number, 3.5 mm. long.— San Luis Potosi.

II. CHRYSACTINIA sect. **Phylloloba** Blake, n. sect. Folia 3–17-pinnatilobata. Corollae radii albidae et aurantiaco-suffultae vel aureae; corollae disci aurantiacae vel aureae.— Type *C. pinnata* Wats.

3. C. PINNATA Wats. ! Proc. Am. Acad. xxv. 154 (1890).— Leaves opposite, oblong, pinnatilobed almost to the midrib with 9–17 opposite oblique oblong to (uppermost) deltoid mucronate acute lobes, sparsely gland-dotted, 2.5–4.9 cm. long, 1.2–1.9 cm. wide, the lowest pair of lobes reduced and stipule-like. Rays 8, whitish, orange-tinged outside; disk orange.— Nuevo Leon: *Pringle* 2524 (TYPE).— Described by Watson as herbaceous, but apparently frutescent like the other species of the genus.

4. C. TRUNCATA Wats. ! l. c. (1890).— Leaves opposite or the upper alternate, ovate to ovate-oblong in outline, pinnatilobed nearly to the midrib with 3–7 mostly alternate lobes, the lobes entire or with 1–few spinulose teeth, truncate and glandular-mucronate at apex (or the terminal sometimes acute), 1.5–2.4 cm. long, 8–12 mm. wide.— Nuevo Leon: *Pringle* 2601 (TYPE).— The rays are described by Watson as bright yellow.

COREOPSIS **basalis** (Dietr.) Blake, n. comb.— *Calliopsis basalis* Dietr. in Otto & Dietr. Allgem. Gartenzeit. iii. 329 (17 Oct. 1835). *Calliopsis Drummondii* D. Don ! in Sweet, Brit. Fl. Gard. ser. 2. iv. t. 315 (1838). *Coreopsis Drummondii* (D. Don) Torr. & Gray, Fl. N. Am. ii. 345 (1842).— The long and detailed description by Otto & Dietrich of their *Calliopsis basalis* shows it to be identical with the

plant soon afterward described and figured by David Don as *Calliopsis Drummondii*, which has generally passed in American literature as *Coreopsis Drummondii*. The seed from which the plant was grown at the Berlin Garden was stated by Otto & Dietrich to have come from Missouri, but as it was included in a large lot of seeds received at second hand from an unknown collector there was obvious chance of error in regard to its origin, and there can be no doubt that it really came from Texas, to which the species is apparently confined. The probable identity of *Calliopsis basalis* and *C. Drummondii* was first brought to my attention through a manuscript note on a sheet in the British Museum by Mr. S. LeM. Moore, to whom I am indebted for permission to publish this note.

The form with linear or linear-oblong leaf-lobes described by Gray (Syn. Fl. i. pt. 2. 291 (1884)) as *Coreopsis Drummondii* var. *Wrightii* becomes C. BASALIS (Dietr.) Blake var. **Wrightii** (Gray) Blake, n. comb.

II. NEW, RECLASSIFIED, OR OTHERWISE NOTEWORTHY SPERMATOPHYTES.

By B. L. Robinson.

Cleome aculeata L. Syst. ed. 12, iii. 232 (1768). To the synonymy of this species should be added *C. sinaloensis* Brandegee, Zoe, v. 198 (1905). Authentic material of the latter, now in the Gray Herbarium, appears to agree in all features with South American specimens of *C. aculeata* L. The species has also been found elsewhere in Mexico, in Guatemala (*Deam*, no. 349), and in Honduras (*Thieme*, no. 5135 of J. D. Smith's distrib.). It thus seems to be an annual weed of rather wide distribution in tropical and subtropical America. The species was originally described by Linnaeus from American material and has been generally regarded as exclusively of this continent, but it is difficult to find a single character on which to separate from it the West African *C. ciliata* Schum. & Thonn. Besk. Guin. Pl. ii. 68 (1828) and *C. guineensis* Hook. f. in Hook. Nig. Fl. 218 (1849).

C. Fischeri, nom. nov. *C. serrulata* Pax in Engl. Bot. Jahrb. xiv. 293 (1892), not Pursh, Fl. Bor. Am. ii. 441 (1814). Pursh's homonym, rejected by Dr. Gray and by many other botanists owing to its inappropriate and undescriptive character, is now being re-established according to the International Rules of Botanical Nomenclature. Consequently the later homonym of Pax must be renamed.

The next three new combinations, found necessary during recent work of Mr. George Safford Torrey, temporary assistant at the Gray Herbarium, are here published at Mr. Torrey's request.

Hosackia americana (Nutt.) Piper, var. **glabra** (Nutt.) G. S. Torrey, comb. nov. *H. elata, β. glabra* Nutt. in Torr. & Gray, Fl. N. Am. i. 327 (1838).

Piriqueta caroliniana (Walt.) Urb., var. **viridis** (Small) G. S. Torrey, comb. nov. *P. viridis* Small, Fl. S. E. U. S. 794, 1335 (1903). Distinguished from varieties of the variable *P. caroliniana* merely by the degree of pubescence, and possessing no distinctive habitat or geographical range, this form seems hardly worthy of specific rank.

Lyonia fruticosa (Michx.) G. S. Torrey, comb. nov. *Andromeda ferruginea β. fruticosa* Michx. Fl. Am. Bor. i. 252 (1803). *A. ferruginea* Pursh, Fl. Am. Sept. i. 292 (1814), not *A. ferruginea* Walt. Fl. Car.

138 (1788). *Lyonia ferruginea* Nutt. Gen. i. 266 (1818), as to plant, not as to name-bringing synonym. *Xolisma fruticosa* Nash, Bull. Torr. Bot. Club, xxii. 153 (1895).

THE STATUS OF CONVOLVULUS AFRICANUS. The binomial *Convolvulus africanus* seems first to have been used by Choisy in DeCandolle's Prodromus, ix. 342 and 418 (1845), where it is attributed to "Nick." or "Nich.," said to have been published in "h. St. Dom.", and is referred to the synonymy of *Pharbitis cathartica* (Poir.) Choisy. In the Index Kewensis, i. 600 (1895), *Convolvulus africanus* Nickols, Hort. St. Doming. 260, is referred to *Ipomoea cathartica*. This disposition of the species is also made by House in his North American Species of the Genus Ipomoea, 205 (1908). Both on nomenclatorial and geographic grounds the name *Convolvulus africanus* (1776) seemed so strange a synonym for the much later and strictly American *Ipomoea cathartica* (1816), that the writer made some search for the rare work in which the name in question was originally published. This proves to be an "Essai sur l'histoire naturelle de l'isle de Saint-Domingue," published at Paris in 1776. The name of the author does not appear on the title page, but toward the end of the volume, on page 374, there is printed a note of "Approbation" by Adanson, regarding the work itself, and in this note the name of the author, P[ère] Nicolson, is mentioned. It may be noted that neither the title of the work nor the spelling of the author's name is as given in the Index Kewensis.

On the page cited in the Index Kewensis (260) the only *Convolvulus* is not *C. africanus* but *C. americanus*, a species treated as follows:

"LIANE purgative.— *Syn*. Liane à médicine. Liane à Bauduit, Arepeea, *Car*. Convolvulus Americanus.— *Obs*. Ses tiges sont grimpantes, cylindriques, sans vrilles; elles s'entrelacent dans les branches des arbres voisins, s'y accrochent, & se replient ensuite vers la terre, y prennent racine, & forment de nouvelles plantes. On en tire un suc résineux qui se coagule, & dont on se sert pour purger. Un habitant du cul-de-sac nommé *Bauduit*, en fait un syrop purgatif qui porte son nom. Quoiqu'il soit fort en usage parmi les habi- [here begins page 261] tans du pays, il ne laisse pas d'être dangereux, en ce qu'il occasionne quelquefois des superpurgations. Ses feuilles sont taillées en coeur, un peu rudes, unies, sans dentelure.— *Loc*. Elle se trouve sur les mornes dans les lieux humides.— *Virt*. Elle purge violement.

LIANE purgative du bord de la mer.— *Syn* Convolvulus marinus, Catharticus, Pl. Soldanella, *Marcg*.— *Obs*. Sa feuille est arrondie, bien nourrie.— Loc. On ne la trouve que sur les côtes de la mer.— *Virt*. Elle est purgative."

On page 213 of the same work occurs the following:

"Convolvulus. *V.* Patate.
Convolvulus Americanus. *V.* Jalap, Liane purgative.
Convolvulus marinus cathartieus. *V.* Liane purgative du bord de la mer.
Convolvulus tinctorius. *V.* Liseron."

While on page 251 is found the following:

"Jalap.— *Syn.* Jalapa, Mirabilis, Convolvulus Americanus, *Ray.*"

From the above we see that the references of Choisy in DC. Prod. ix. 342 and 418, of Hook. f. & Jacks. Ind. Kew. i. 600, and of House, North American Species of Ipomoea, 205, are incorrect in several particulars. The binomial is *Convolvulus americanus* not *C. africanus*. The name of the author is Nicolson, not Nickols, as given by the Index Kewensis, nor Nich., as given by Choisy (page 418). The name of the work is Essai sur l'histoire naturelle de l'isle de Saint-Domingue, obscurely abbreviated by Choisy (p. 342) to h. St. Dom., and mistakenly rendered by the Index Kewensis as Hort. St. Doming.

Finally it remains to ascertain whether this early name really belongs to the species *Ipomoea cathartica* Poir., to which it has been referred by these authors, and whether if so it should replace this later name.

The cross-references in Nicolson's work show an association by that author of his Liane purgative with *Convolvulus americanus* of Ray and also with the vernacular name Jalap. On referring to Ray's well known Historia Plantarum, iii. 372 (1704), we find three uses of the name *Convolvulus Americanus*, namely:

"17. Convolvulus *Americanus*, vulgaris folio, capsulis triquetris numerosis, ex uno puncto longis petiolis propendentibus, semine lanugine ferruginea villoso *Pluk. Almag. Bot.* Hujus species major habetur, **Mock-climber** *Barbadensibus* dicta."

"19. Convolvulus *Americanus* sub Jalapiae nomine receptus *Pluk. Phyt.* T. 25. F. 1. An Convolv. colubrinus *Pisonis* Caapeba?"

"22. Convolvulus *Americanus*, subrotundis foliis viticulis spinosis *Pluk. Almag. Bot.* T. 276. F. 4. An Convolvulus *Peruvianus* perpetuus seu Hololiuchi *Hort. Farnes.* Fig. 4? Reliqua vide apud Autorem."

Of these three uses of *Convolvulus americanus* by Ray, it is clear that the first (Ray's no. 17) is *Ipomoea polyanthes* G. F. W. Mey., while the third (Ray's no. 22), described as having suborbicular leaves and being spiny must have referred to Plukenet's Plate 276, fig. 3 rather than fig. 4 as stated, and was *Calonyction aculeatum* (L.) House. That it was to the second, namely Ray's no. 19, to which

Nicolson referred is clearly shown by the expression "sub Jalapiae nomine." Of this plant Plukenet gives a figure cited by Ray and doubtless in the opinion of Ray representing his plant. This figure shows a highly conventionalized twiner with alternate deltoid-ovate entire leaves and solitary short-peduncled axillary flowers. The flowers show no corolla but merely a small calyx with relatively short lobes which do not equal the tube. It is impossible to regard this figure as representing *I. cathartica* Poir. which is characterized by calyx-lobes of unusual length, greatly exceeding the short tube. The writer after some search has failed to find that Linnaeus expressed any opinion in regard to the identity of this particular figure of Plukenet, and from its general lack of detail it would probably be impossible to place it with any certainty.

It may be seen from the data here assembled 1) that Nicolson made no *Convolvulus africanus*, a name which seems to have arisen from a clerical error of Choisy. 2) that Nicolson in employing the name *Convolvulus americanus* had no thought of coining a new designation or describing a new species, but was merely applying — in all probability erroneously — the pre-Linnaean *Convolvulus Americanus* of Ray to a purgative twiner of Santo Domingo. He gives no botanical characterization sufficient to give validity to the name and merely discusses briefly the pharmaceutical properties. Nicolson's type is not known and even if the plant he was treating could be ascertained it is doubtful if the botanical type of *Convolvulus americanus* would not have to be sought in the plant of Ray, whose name Nicolson was intending to apply, rather than the plant to which he perhaps mistakenly applied it. As we have seen, the plant of Ray may be traced back to a figure of Plukenet's which cannot be I. CATHARTICA Poir., a well known name that thus relieved of an earlier synonym retains its validity.

Ipomoea crassicaulis (Benth.), comb. nov. *Batatas* ? *crassicaulis* Benth. Voy. Sulph. 134 (1844). *Ipomoea fistulosa* Mart. ex Choisy in DC. Prod. ix. 349 (1845). *I. texana* Coult. Contrib. U. S. Nat. Herb. i. 45 (1890).

OPERCULINA ORNITHOPODA (Robinson) House, var. **megacarpa** (Brandegee), comb. nov. *Ipomoea* sp. Rose, Contrib. U. S. Nat. Herb. i. 344 (1895). *I. megacarpa* Brandegee, Zoe, v. 218 (1905). *Operculina Roseana* House, Bull. Torr. Bot. Club, xxxiii. 500 (1906); Bot. Gaz. xliii. 414 (1907). Formae typicae floribus fructu etc. simillima differt foliorum segmentis multo latioribus(0.9–3.5 cm. latitudine). The writer agrees with Mr. House that this plant, differing in range

and rather strikingly in foliage, should not be merged without distinction in *O. ornithopoda*, yet the differences are of slight moment and the divergence between the extremes is very largely bridged by intermediates. Thus the specimen collected at Agiabampo by Palmer (no. 781) has the leaf-segments ranging down to 6 mm. in breadth, being therefore considerably nearer to the form from San Luis Potosi than to Mr. Brandegee's plant from Culiacan, which has leaf-segments no less than 3.5 cm. wide. Accordingly, the varietal rank here seems preferable to the specific.

LANTANA ACHYRANTHIFOLIA Desf. Cat. Pl. Hort. Reg. Par. ed. 3, 392 (1829). To the synonymy of this species may be added *Lippia fimbriata* Rusby, Mem. Torr. Bot. Club, iv. 244 (1895), and *Lantana macropodioides* Greenm. Field Mus. Nat. Hist. Bot. Ser. ii. 339 (1912).

Stachytarpheta fruticosa (Millsp.), comb. nov. *Valerianodes fruticosa* Millsp. Field Columb. Mus. Bot. Ser. ii. 178 (1906).

PRIVA ASPERA HBK. Nov. Gen. et Spec. ii. 278 (1817). While this species is known to me only by descriptions, I fail to find any distinction by which *P. orizabae* Wats. Proc. Am. Acad. xxiii. 282 (1888) can be separated from it.

Rhaphithamnus venustus (Phil.), comb. nov. *Citharexylum venustum* Phil. Bot. Zeit. xiv. 646 (1856). *Rhaphithamnus longiflorus* Miers, Trans. Linn. Soc. xxvii. 98 (1870); Reiche, Fl. Chil. v. 306 (1908). *R. serratifolius* Miers, l. c. 99. *Citharexylon elegans* Phil. ex Miers, l. c. 98 (1870).

Vitex Bakeri, nom. nov. *V. diversifolia* Baker in Thiselton-Dyer, Fl. Trop. Afr. v. 323 (1900), not Kurz, "Andam. Rep. App. A 45; B 14" (1870?); C. B. Clarke in Hook. f. Fl. Brit. Ind. iv. 585 (1885).

Vitex viticifolia (DC.), comb. nov. *V. montevidensis* ? *multinervis* Cham. Linnaea, vii. 374 (1832). *Psilogyne viticifolia* DC. Rev. Fam. Bign. 16 (1838). *V. multinervis* (Cham.) Schauer in DC. Prod. xi. 688 (1847), also in Mart. Fl. Bras. ix. 297 (1851). The earlier *specific* name is here restored in accordance with Art. 49 of the International Rules of Botanical Nomenclature.

Caryopteris odorata (Hamilton), comb. nov. *Volkameria odorata* Hamilton ex Roxb. Hort. Beng. 46 (1814). *Clerodendron odoratum* (Hamilton) D. Don, Prod. Fl. Nepal. 102 (1825). *Caryopteris Wallichiana* Schauer in DC. Prod. xi. 625 (1847); Clarke in Hook. f. Fl. Brit. Ind. iv. 597 (1885).

Sphenodesme involucrata (Presl), comb. nov. *Congea unguiculata* Wall. Cat. n. 1736 (nomen). *C. ferruginea* Wall. l. c. n. 1737 (nomen). *C. paniculata* Wall. l. c. n. 1739 (nomen). *Symphorema*

paniculatum h. Heyne ex Schauer in DC. Prod. xi. 623 (1847), in synon. *Vitex involucratus* Presl, Bot. Bemerk. 148 (1844). *Sphaenodesma unguiculata* (Wall.) Schauer in DC. Prod. xi. 623 (1847).

In a recent attempt to verify the identification and labelling of the *Verbenaceae* in the Gray Herbarium, corrections were noticed which should be made in the current treatment of two species of the Galapagos Islands, namely:

1) The plants which have been treated as *Avicennia tomentosa* Hook. f. Trans. Linn. Soc. xx. 195 (1847); Anderss. Om Galap.-öarnes Veg. 201 (1853), also reprint, 82 (1857); Robinson & Greenman, Am. Jour. Sci. ser. 3, l. 147 (1895); and *A. officinalis* Robinson, Proc. Am. Acad. xxxviii. 194 (1902), not L., are referable to A. NITIDA Jacq.

2) The plants of the Galapagos Islands treated as *Lippia lanceolata* Rose, Contrib. U. S. Nat. Herb. i. 137 (1892), not Michx.; *L. nodiflora* Robinson & Greenman, Am. Jour. Sci. ser. 3, l. 147 (1895), not Michx.; and *L. canescens* Robinson, Proc. Am. Acad. xxxviii. 196 (1902), not HBK., are all to be referred to L. REPTANS HBK. Nov. Gen. et Spec. ii. 263 (1817), a species fairly well marked as to its firmer veins and more salient teeth of the leaves.

AGERATUM HOUSTONIANUM Mill., var. **muticescens**, var. nov., statura foliis pubescentia floribus etc. formae typicae simillimum differt squamis pappi flosculorum vel omnium vel plurium valde reductis muticis ca. 0.1–0.2 mm. longis.— MEXICO: Wartenberg, near Tantoyuca, prov. Huasteca, collected in 1858, *L. C. Ervendberg*, no. 100 (TYPE, in Gray Herb.); without locality, from the herbarium of the late Dr. F. W. Klatt (Gray Herb.); cultivated in the Missouri Botanical Garden, from 1886 (when collected by Pammel) to 1896 (when a second specimen was prepared by H. C. Irish). The specimens, now in the herbarium of the Missouri Botanical Garden, show by their labelling that the plant has passed under several horticultural names, "Stella Gurney," "Cope's Pet," etc. The seed is said to have come from Haage & Schmidt's establishment. In these specimens the pappus, though for the most part short and muticous, shows some variability on one and the same plant or even in the same head, certain florets, especially the central ones and those of the terminal heads, tending to have awned scales in the manner of the typical form.

Eupatorium brachychaetum, spec. nov., herbaceum vel cum caudice ramoso 1 dm. longo paullo lignescenti; caulibus subscaposis 2–2.5 dm. altis gracilibus puberulis purpurascentibus basin versus solum foliosis apice 2–4-capitulatis; foliis oblanceolati-oblongis tenuibus oppositis 8–11 cm. longis 2–2.5 cm. latis duplice crenato-lobulatis vel

-dentatis apice obtusis vel rotundatis basi gradatim cuneatis pinnativeniis in venis sparsissime pilosiusculis concoloribus, petiolo ca. 1 cm. longo gracili; capitulis oblato-subsphaericis 1 cm. diametro in pedicellis nudis vel bracteolatis gracilibus pilosiusculis purpurascentibus adscendentibus valde inaequalibus (1–10 cm. longitudine) gestis; involucri squamis oblongis vel obovato-oblongis subbiseriatis subaequilongis striatulis glabriusculis ciliolatis vix acutis 2.5 mm. longis; flosculis 40–50; corollis glabris 2.2 mm. longis, tubo proprio cylindrico fauces campanulatas subaequanti, dentibus limbi anguste deltoideis recurvatis; antheris apice appendiculatis; achaeniis fuscis glabris 1.5 mm. longis; pappi setis ca. 20 inaequalibus pro genere brevibus corolla dimidio brevioribus.— CUBA: Rocky stream bed, Arroyo Cimmaron; alt. 470 m., Trinidad Mountains, Santa Clara, 5 March, 1910, *N. L. & E. G. Britton*, no. 5085 (TYPE, in herb. N. Y. Bot. Gard.; and in Gray Herb.). A slender and attractive species, which should be readily recognized by its exceptionally short pappus.

Var. **extentum**, var. nov., valde caulescens; caulibus 3 dm. vel ultra longitudine gracilibus foliosis; foliis oppositis; internodiis plerisque 1–5 cm. longis; pedunculis 6–8 cm. longis; aliter formae typicae simillimum.— CUBA: Rocky and shady banks of Iguanojo River, Santa Clara, 11 Aug. 1915, *Brothers Leòn & Clement*, no. 5419 (TYPE, in herb. N. Y. Bot. Gard.; phot. in Gray Herb.).

Eupatorium bullescens, spec. nov., fruticosum 6–10 dm. altum; caule tereti gracili virgato usque ad apicem folioso striatulo puberulo; foliis sessilibus oppositis ovato-lanceolatis acuminatis serratis firmiusculis basi rotundatis vel saepius brevissime cordatis a basi trinerviis glabris supra bullatis lucidis minute reticulato-venulosis subtus paullulo pallidioribus opacis nervosis puncticulatis 4–6.8 cm. longis 1.3–2.4 cm. latis internodia valde superantibus; inflorescentia laxe paniculata terminali folioso-bracteata, ramis gracilibus obscure puberulis; patentibus pedicellis 2–8 mm. longis filiformibus; capitulis parvis 6–9-floris; involucri squamis ca. 7 subaequalibus oblongis obtusis dorso obscure puberulis ca. 2.2 mm. longis post fructus delapsum persistentibus et deflexis, disco parvo levissime convexo glabro; corollis glabris tubulatis sursum leviter ampliatis ca. 2 mm. longis, dentibus limbi 5 deltoideis suberectis; achaeniis gracilibus fuscis minute granulatis ca. 2 mm. longis; pappi setis ca. 20 sordide albidis corollam subaequantibus.— CUBA: on rocks, gorge of the Rio Yamui, Oriente, 7–9 December, 1910, *J. A. Shafer*, no. 7808 (TYPE, in herb. N. Y. Bot. Gard., photograph and fragments in Gray Herb.); also in pine lands, alt. 420 m., near El Cuero, Oriente, 10–19 March, 1912,

N. L. Britton & J. F. Cowell, no. 12,763 (herb. N. Y. Bot. Gard.; photograph in Gray Herb.).

Eupatorium epaleaceum (Gardn.), comb. nov. *Chromolaena epaleacea* Gardn. in Hook. Lond. Jour. Bot. vi. 436 (1847). *Eupatorium lupulinum* Bak. in Mart. Fl. Bras. vi. pt. 2, 301 (1876).

EUPATORIUM HAVANENSE HBK., var. **domingense** (DC.), comb. nov. *E. ageratifolium* γ *? domingense* DC. Prod. v. 173 (1836).

EUPATORIUM KLEINIOIDES HBK., var. **lasiolepis**, var. nov., formae typicae simile differt praecipue involucri squamis dorso conspicue pubescentibus, pilis tenuibus attenuatis curvato-adscendentibus vel irregulariter patentibus.— Tropical BRAZIL, *Burchell*, no. 6885 (TYPE, in Gray Herb.).

EUPATORIUM LEUCOCEPHALUM Benth., var. **anodontum**, var. nov., formae typicae habitu inflorescentia floribus etc. simile differt foliis paullo angustioribus lanceolatis omnino integerrimis.— White-flowered shrub 2–3 m. high in clayey soil, alt. 1000 m., at La Victoria, near the boundary between Michoacan and Guerrero, Mexico, 23 March, 1899, *E. Langlassé*, n. 961 (TYPE, in Gray Herb.).

EUPATORIUM MAIRETIANUM DC., var. **adenopodum**, var. nov., caule apicem versus et ramis et ramulis et pedicellis ubique dense glanduloso-puberulis fuscescentibus nec ut apud formam typicam canescenti-arachnoideis; aliter formam typicam simillimum.— GUATEMALA: Cerro Quemado, Quezaltenango, 21 January, 1915, alt. 2440 m., *Prof. E. W. D. Holway*, no. 98 (TYPE, in Gray Herb.).

EUPATORIUM PULCHELLUM HBK., var. **angustifolium** Wats. in herb. according to Pringle, Plantae Mexicanae, 1889, 2nd [unnumbered] page of the printed list, also on the labels.— This marked variety, recognized by Dr. Sereno Watson, seems never to have been characterized. It may be described as follows: statura habitu inflorescentia formae typicae simile differt foliis elongato-lanceolatis 8–10 cm. longis 1–1.8 cm. latis adscendentibus vel modice patentibus nec deflexis inconspicue serratis vel subintegris sparse in nervis venisque hispidulis utrinque viridibus, supremis angustissimis.— MEXICO: slopes of cañons near Guadalajara, Jalisco, 4 October, 1889, *C. G. Pringle*, no. 2315 (TYPE, in Gray Herb.); barranca of Rio Blanco near Guadalajara, alt. 1375 m., 30 September, 1903, *Pringle*, no. 11,524 (Gray Herb.). Easily recognized by its long narrow ascending leaves 5–8 times as long as wide, while in the typical form they are mostly deflexed and rarely 3 times as long as broad, being furthermore inclined to be more deeply serrate and tending to be distinctly paler beneath.

Eupatorium pycnocephaloides, spec. nov., suffrutescens in ar-

bustis alte scandens pubescens; caulibus teretibus striatis flexuosis purpurascentibus internodiis ad 1.8 dm. longis; foliis oppositis petiolatis ovato-deltoideis acuminatis 5–6.5 cm. longis 4–4.8 cm. latis crenato-serratis basi subtruncatis membranaceis a basi trinerviis utrinque viridibus supra appresse puberulis subtus praecipue in nervis venisque laxe pubescentibus, petiolo 2–3.5 cm. longo; paniculis terminalibus oppositirameis foliaceo-bracteatis, ramis late patentibus; capitulis 15–20-floris in capitibus terminalibus convexis vel subglobosis laxe glomeratis, pedicellis 2–4 mm. longis filiformibus pubescentibus; involucri subcylindrici basi turbinato-campanulati 6–7 mm. alti squamis ca. 3-seriatis valde inaequalibus viridibus plus minusve purpurascentibus striatis dorso pubescentibus, extimis brevibus ovatis acuminatis, intermediis oblongis acutis, intimis lineari-oblongis apice obtusis; corollis albis vel roseis glabris 5-nerviis (nervis a basi ad sinum inter dentes percurrentibus) anguste tubulatis sine faucibus distinctis 4 mm. longis, limbi dentibus 5 deltoideis 0.3 mm. longis; achaeniis atrobrunneis 1.7 mm. longis in angulis et inter eos sursum hispidulis; pappi setis ca. 25 albis tenuibus quam corolla paullo brevioribus.—GUATEMALA: Climbing over shrubs, Sololá, alt. 2135 m., 28 January, 1915, *Prof. E. W. D. Holway*, no. 144 (TYPE, in Gray Herb.); Volcan de Agua, Antigua, alt. 2135 m., 13 January, 1915 (in bud), *Holway*, no. 83 (Gray Herb.). A species somewhat resembling *E. pycnocephalum* Less., but much larger, the involucral bracts more pubescent, the outer narrower and more acute.

Var. **glandulipes**, var. nov., pedicellis et involucri squamis glanduloso-puberulis; flosculis roseis; achaeniis subglabris faciebus lucidis costis solis paullo sursum hispidulis.—GUATEMALA: Totonicapam, alt. 2440 m., 24 January, 1915, *Prof. E. W. D. Holway*, no. 106 (TYPE, in Gray Herb.).

Eupatorium rhexioides, spec. nov., laxe caespitosum glabriusculum stragulum 1 m. diametro formans; caulibus elongatis apicem versus ramosissimis flexuosis angulato-striatis; internodiis inferioribus elongatis ad 1.5 dm. longitudine superioribus multo brevioribus vix 1 cm. longis; ramis valde flexuosis plerisque alternis in inflorescentias racemosas terminantibus; foliis parvis deflexis ovato-lanceolatis vel lanceolato-ellipticis, inferioribus oppositis, ramealibus plerisque alternis ca. 2 cm. longis 6–9 mm. latis crassiusculis utrinque glabris subtus paullo pallidioribus 3-nerviis puncticulatis integris vel utroque latere obtuse 2–3-dentatis acutiusculis margine plus minusve revolutis basi cuneatis, petiolo 1–3 mm. longo; racemis plus minusve compositis bracteatis; bracteis inferioribus foliis similibus superioribus gradatim

reductis linearibus pedicellos (2–7 mm. longos) obscure puberulos longitudine paullo superantibus; capitulis parvis ca. 12-floris; involucri vix imbricati squamis 7–10 linearibus acutis minute puberulis crassiusculis maturitate stellatim patentibus ad 5 mm. longis; flosculis 6.8 mm. longis; corolla tubiformi gramulata sursum paullo ampliata 3.6 mm. longa, limbi dentibus deltoideis brevibus patentibus; antheris apice cum appendice ovata membranacea munitis; achaeniis gracilibus deorsum attenuatis ca. 3.2 mm. longis 5-angulatis costulis secundariis 1–2 inter costas primarias hinc inde interjectis; pappi setis sordidis ca. 30 vix barbellatis tenuibus corollam aequantibus.—CUBA: moist banks, on the trail from Camp La Barga (alt. 450 m.) to Camp San Benito (alt. 900 m.), Oriente, 22–26 February, 1910, *J. A. Shafer*, no. 4105 (TYPE, in herb. N. Y. Bot. Gard.; photograph and fragment in Gray Herb.).

EUPATORIUM SCHULTZII Schnittspahn, Zeitschr. d. Gartenbauvereins z. Darmst. 1857, p. 6. This species appears to have four distinguishable forms, which may be briefly characterized as follows:

Forma **typicum**, pedicellis dense cum glandulis capitatis numerosissimis puberulis, pilis paucis non capitatis hinc inde interspersis; involucri squamis albidis, intermediis elliptico-oblongis apice rotundatis glabris vel subglabris non ciliatis.—Represented in the Gray Herbarium as follows: material cultivated in the Darmstadt Botanical Garden and authoritively labeled by Schultz himself; also VERA CRUZ: Mirador, *Liebmann*, no. 41, *Sartorius* (without number); Zacuapan, *Purpus*, no. 2372; CHIAPAS: *C. & E. Seler*, no. 2219; COSTA RICA: Ojo de Agua, *Hoffmann*, no. 394, Rodeo de Pacaca, *Pittier*, no. 3285, slopes of Rodeo, at 1100 m. altitude, *Pittier*, no. 1600; GUATEMALA: Cubelquitz, Depart. Alta Verapaz, alt. 350 m., *von Tuerckheim*, no. 7888.

Forma **erythranthodium**, forma nova, formae typicae simile sed differt conspicuiter involucri squamis pulchriter purpureis.—GUATEMALA: Coban, altitude 1350 m., *von Tuerckheim*, no. II. 2090 (TYPE, in Gray Herb.).

Forma **velutipes**, forma nova, formae typicae simile differt pedicellis velutino-tomentellis vix vel solum obsolescente glandulosis.—GUATEMALA: San Lucas Toliman, Sololá, altitude 1560 m., 2 February, 1915, *Prof. E. W. D. Holway*, no. 170 (TYPE, in Gray Herb.); Depart. Guatemala, alt. 1525 m., *J. D. Smith*, no. 2373; on the volcano of Tecuamburro, Depart. Santa Rosa, alt. 2135 m., *Heyde & Lux*, no. 4515 (distrib. of J. D. Smith).

Var. **ophryolepis**, var. nov., pedicellis dense cum glandulis capitatis

puberulis; involucro paullo quam eo formae typicae imbricatiori, squamis purpureo-viridibus striatis, exterioribus intermediisque plus minusve acutatis, intermediis ciliatis.—GUATEMALA: in woods, Volcan de Atitlan, Sololá, alt. about 2135 m., *Prof. E. W. D. Holway*, no. 187 (TYPE, in Gray Herb.).

Eupatorium Shaferi, spec. nov., herbaceum vel vix basi paullo molliter lignescens glabrum 3–4 dm. altum; caule basi paullo decumbens fistuloso purpureo-brunneo ad mediam partem folioso; foliis oppositis ovato- vel lanceolato-oblongis utroque acuminatis serratis utrinque glaberrimis subtus paullo pallidioribus 4–8 cm. longis 2–3.5 cm. latis pinnativeniis; petiolo 1–1.5 cm. longo supra canaliculato; panicula parva 4 cm. solum diametro sub-6-capitulata vel ampliori 3-chotoma 1 dm. diametro multicapitulata; bracteis oblanceolato-linearibus, bracteolis lineari-subulatis; pedicellis ca. 1 cm. longis adscendentibus obscurissime puberulis; capitulis 1 cm. diametro 15–20-floris; involucri 2–3-seriati squamis subaequalibus laxe imbricatis oblongis obtusis vel apice rotundatis ciliolatis quam flosculis dimidio brevioribus post fructus delapsum persistentibus et reflexis, disco maturitate leviter convexo glabro; corollis glabris tubulatis sursum modice gradatimque ampliatis 3 mm. longis purpureis; achaeniis 5-angulatis deorsum decrescentibus basi substipitatis glabris aetate fuscis pallide costatis 2.8 mm. longis; pappi setis simplicibus tenuibus sordide albis achaenium longitudine subaequantibus.—CUBA: on rocks by water near top of falls, Arroyo del Medio, Oriente, alt. 450–550 m., 20 December, 1909, *J. A. Shafer*, no. 3227a (TYPE, in herb. N. Y. Bot. Gard., photograph and fragments in Gray Herb.); also on rocks by water, same locality, date, and collector, no. 3227 (herb. N. Y. Bot. Gard.; photograph and fragments in Gray Herb.).

EUPATORIUM URTICAEFOLIUM Reichard, var. **angustatum** (Gray), comb. nov. *E. ageratoides* L.f., var. *angustatum* Gray, Syn. Fl. i. pt. 2, 101 (1884). *E. angustatum* (Gray) Greene, Pitt. iv. 277 (1901). *Kyrstenia angustata* (Gray) Greene, Leafl. i. 8 (1903).

EUPATORIUM VITIFOLIUM (Sch. Bip.) Klatt, Leopoldina, xx. 90 (1884). *Hebeclinium vitifolium* Sch. Bip. ex Klatt, l. c. To the synonymy of this rare and little known Mexican species may be added *Bulbostylis triangularis* DC. Prod. vii. 268 (1838) and *Carphephorus triangularis* (DC.) Gray, Pl. Wright i. 86 (1852) ex Hemsl. Biol. Cent.-Am. Bot. ii. 109 (1881). The type-specimens, both of DeCandolle's and of Klatt's species, are exceedingly fragmentary, yet material is sufficient to show close correspondence in general contour, dentation, size, and venation of the leaf, open divaricately branched panicle,

largish heads with narrow unequal acute involucral scales passing inward into narrow somewhat readily deciduous paleae. The achenes are 4–5-angled as described by DeCandolle and the species is therefore referable to *Eupatorium* rather than to *Brickellia*. With *Carphephorus*, notwithstanding the presence of a few paleae on the outer part of the disk, the species appears to have no close affinity. The older specific name (*triangularis*) having been already several times employed for other species of *Eupatorium*, cannot be here revived. The only difference noted between the type of *E. vitifolium* and that of *Bulbostylis triangularis* is that in the single leaf of the latter, still preserved in the DeCandollean herbarium, the base is essentially truncate, while in the Liebmann plant, upon which Klatt's species was founded, the leaf-base, though in the main outline truncate, is slightly cordate at the insertion of the petiole. In consideration of the close correspondence in all other features observed, this one slight difference is believed to be merely individual. At all events, until the plants can be examined in more complete specimens even a varietal separation seems unwise.

Brickellia cymulifera, spec. nov., subherbacea 3–4 dm. alta: caulibus gracilibus teretibus foliosis plus minusve decumbentibus crispe puberulis, internodiis 3–8 cm. longis; foliis oppositis graciliter petiolatis hastato-deltoideis caudato-acuminatis grosse dentatis basi cordatis utrinque viridibus sparse crispeque puberulis, laminis 3–5.4 cm. longis 2.5–3.8 cm. latis, petiolo 1–4 cm. longo; cymis oppositis laxe patentibus 3–5-capitulatis in axillis a parte media caulis (vel etiam a parte inferiori) usque ad apicem orientibus, pedunculis subfiliformibus crispe puberulis 2–3.5 cm. longis in media parte bracteas binas foliaceas ovatas acuminatas integras gerentibus et ad apicem bracteolis binis parvis linearibus munitis; pedicellis filiformibus crispe puberulis saepe bracteolatis 4–15 mm. longis; capitulis (valde immaturis) ca. 12-floris 6 mm. altis et diametro; involucri turbinato-campanulati squamis ca. 17 convexis viridibus vel atro-purpureis tenuiter striatis ciliolatis apice rotundatis, extimis dorso puberulis orbiculatis, intermediis ovato vel obovato-oblongis dorso subglabris, intimis oblanceolato-oblongis; corollis (immaturis) cylindricis sparse granulatis 5-dentatis; achaeniis (immaturis) obconicis tomentellis; pappi setis 40-50 valde inaequalibus barbellatis albis.— Mexico: Minas de San Rafael, San Luis Potosi, November, 1910, *Dr. C. A. Purpus*, no. 4802 (type, in Gray Herb., the same number also examined in herb. Mo. Bot. Gard.).

Conyza sophiaefolia HBK. Nov. Gen. et Spec. iv. 72, t. 326

(1820). To the synonymy of this species may be added *Erigeron canadensis* as cited in J. D. Sm. Enum Pl. Guat. iv. 78 (1895), as to no. 6152.

Verbesina Holwayi, spec. nov., ut videtur herbacea erecta robusta; caule tereti medulloso glabro purpurascenti-brunneo exalato levissime striatulo usque ad inflorescentiam laxe folioso; foliis alternis ovato-deltoideis utroque latere 1–2-lobatis supra rugosis cum venis impressis reticulatis cum pilis brevissimis albidis scaberrimis subtus paullo pallidioribus viridibus molliter tomentellis ad 1.8 dm. longis 1.4 dm. latis, petiolo ad 9 cm. longo late alato (2 cm. latitudine) basi auriculato-amplexicauli, lobis folii inaequalibus ovato-oblongis plus minusve falcatis 3–5 cm. longis 3 cm. latis apice rotundatis margine irregulariter serrato-dentatis, lobo terminali multo majori subacuminato, costa media subtus prominenti, venis pinnatis in petiolo transversis in lamina prorsus curvatis; foliis superioribus gradatim reductis lanceolatis, bracteis ultimis spatulatis vel linearibus minimis; panicula ampla 3 dm. diametro plana multicapitulata sordide puberula vel tomentella, ramis et pedicellis (8–14 mm. longis) adscendentibus; capitulis (fructigeris) contiguis ovoideis ca. 8 mm. diametro 1 cm. altis ca. 25-floris ut videtur discoideis; involucri squamis extimis linearibus inaequalibus dorso sordide pubescentibus acutiusculis, intimis spatulato-oblongis carinatis mucronulatis in media parte subherbaceis pubescentibus margine utroque tenuioribus subchartaceis; paleis similibus; disco conico; achaeniis nigris 3.2 mm. longis bialatis in faciebus pallide tuberculatis, alis albidis ciliolatis; aristis 2 erectis 1.5 mm. longis tenuibus barbellatis.—GUATEMALA: Quezaltenango, alt. 2290 m., January, 1915, *Prof. E. W. D. Holway*, no. 96 (TYPE, in Gray Herb.). This species is probably referable to § *Lipactinia* Robinson & Greenman, Proc. Am. Acad. xxiv. 563 (1899), though in the fruiting material at hand it is difficult to be sure of the absence of rays. It would seem to be most naturally placed near *V. auriculata* DC. Prod. v. 617 (1836) with which it agrees in many points, though it is readily distinguished by its different inflorescence and lobed leaves.

Liabum sublobatum, spec. nov., caule tereti (exsiccatione) striato-ruguloso puberulo brunnescenti ad inflorescentiam laxe patenteque folioso; foliis oppositis late ovato-rhomboideis acuminatis hastato-subtrilobatis mucronulato-dentatis (dentibus inaequalibus) basi integris cuneatis in petiolum acuminate decurrentibus supra laete viridibus glabris subtus arachnoideo-tomentosis 1–1.3 dm. longis 7–9 cm. latis paullo supra basin 3-nervatis; petiolo ca. 5 cm. longo supra canaliculato puberulo subtus rotundato aetate suberoso-ruguloso; panicula

laxe fastigiata 1.5 dm. diametro convexa vel subpyramidali multicapitulata, ramis ramulisque adscendentibus fusco-puberulis, bracteis inferioribus foliaceis, bracteolis multo reductis lanceolato-subulatis plus minusve connatis sordide tomentosis ca. 3–4 mm. longis; pedicellis 4–5 mm. longis gracilibus rectis; capitulis discoideis 1.3 cm. altis ca. 9 mm. diametro ca. 8-floris; involucri turbinato-campanulati 4-seriati squamis oblongis apice rotundatis dorso striatulis purpureo-viridibus vix puberulis margine obscure ciliatis extimis brevibus suborbiculari-ovatis; corollis laete flavis 8 mm. longis glabris, tubo proprio gracili in fauces gradatim ampliato, dentibus limbi 5 lanceolatis recurvatis; achaeniis glabris crassiusculis; pappi setis albidis obscure barbellatis ca. 6 mm. longis (paucis extimis ter brevioribus).— GUATEMALA: San Lucas Toliman, Sololá, 2 February, 1915, alt. 1665 m., *Prof. E. W. D. Holway*, no. 179 (TYPE, in Gray Herb.). A species near *L. glabrum* Hemsl., but readily distinguished by its somewhat lobed leaves and puberulent inflorescence.

III. CERTAIN BORRAGINACEAE, NEW OR TRANSFERRED.

By J. Francis Macbride.

In the course of ordering up portions of the *Borraginaceae* at the Gray Herbarium it has become necessary from time to time to make new names and new combinations of names in order to have the work conform to the International Rules of Botanical Nomenclature. In addition, an attempt to classify the unnamed material in some of the groups has led to the discovery of a few species and varieties apparently undescribed. It seems advisable, therefore, to place these matters on record at this time.

Tournefortia Miquelii, nom. nov.—*T. syringaefolia* Miquel, Stirp. Surin. 137 (1850), not *T. syringaefolia* Vahl, Symb. Bot. iii. 23 (1794), a name which must be revived to replace the more generally used but later synonym *T. laurifolia* Vent. Choix Pl. 2 (1803).

Tournefortia Aubletii, nom. nov.— *T. glabra* Aubl. Pl. Guian. i. 118 (1775), not *T. glabra* L. Sp. Pl. 141 (1753), which must replace *T. cymosa* L. Sp. Pl. ed. 2, 202 (1762).

Heliotropium fragrans, nom. nov.— *H. odorum* (Fres.) Gürke, Nat. Pflanzenf. iv. Ab. 3, 96 (1893). *Heliophytum odorum* Fres. in Mart. Fl. Bras. viii. pt. 1, 45 (1857), not *Heliotropium odorum* Balf. f. Proc. Roy. Soc. Edinb. xii. 81 (1884). Article 53 of the International Rules states that: "When a species is moved from one genus into another, its specific epithet must be changed if it is already borne by a valid species of that genus." Therefore *H. odorum* Fres. requires a new name on being transferred to *Heliotropium* because of the presence there of *H. odorum* Balf. f., a valid species which cannot, according to these rules, be renamed *H. Balfouri* as has been done by Gürke, l. c.

Heliotropium foliosissimum, spec. nov., multicaule decumbens subgriseo-pubescens; radice et caudice lignescentibus atrobrunneis; caulibus 5–14 flexuosis gracilibus basi ad apicem aequabiliter foliosissimus 3–12 cm. longis; foliis elliptico-oblongis margine vix revolutis obtusis nunc alternis nunc suboppositis vel irregulariter dispositis 5–10 mm. longis 2–4 mm. latis; racemis bracteatis brevibus; calycis laciniis oblongo-ovatis; corollae tubo calycem non superante; nucibus strigosis.— Southern Mexico in the State of Oaxaca: Hacienda Blanca, July 25, 1895, *L. C. Smith*, no. 627 (type, in Gray Herb.);

sterile hills, Telixtlahuaca, July 27, 1895, *L. C. Smith*, no. 471; near Oaxaca, July 26, 1896, *C. Conzatti*, no. 157, in part; gravelly soil near Oaxaca, July 3, 1900, *Charles C. Deam*, no. 11; Cerro San Antonio, June 26, 1906, *C. Conzatti*, no. 1411. These specimens were labeled *H. limbatum* Benth., but that species is a more canescent plant of rigid erect habit, and with narrower longer leaves (10–15 mm. long, 1.5–2 mm. wide) and almost glabrous nutlets. The aspect, too, is very different both from the dissimilar manner of growth and because the stems of *H. limbatum* are leafiest at the base, where the leaves persist, while in *H. foliosissimum* the stems are equably leafy and the lower leaves soon die.

Heliotropium jaliscense, spec. nov., suffruticosum erectum, ramis hispidis et adpresse strigillosis; foliis petiolatis ovato-lanceolatis subacuminatis basi attenuatis integerrimis 5–10 cm. longis 2–3 cm. latis utrinque strigillosis et subtus in nervis hispidis; racemis flexuosis gracilibus ebracteolatis pedunculatis; pedunculis subterminalibus; calycis lobis hispidis latitudine inaequalibus subacuminatis; corollae tubo calycem ca. 2 mm. superante; corolla 3.5–4 mm. longa; antherae media in parte tubi insertae; stigmate late conico basi annulato stylum vix superante; nuculis 4 glabris forsan maturitate reticulatis.—Mexico: bushy slopes near San Sebastian, Jalisco, March 16–19, 1897, *E. W. Nelson*, no. 4083 (type, in Gray Herb.). A species bearing a superficial resemblance to *H. parviflorum* L. but by style and fruit characters a member of the section *Euheliotropium*.

Heliotropium phyllostachyum Torr., var. **erectum**, var. nov., caulibus erectis 1–4 dm. altis; foliis oblongo-lanceolatis 1–3 cm. longis ca. 3 mm. latis; corollae tubo calycem superante, limbo 3–5 mm. lato. —Mexico: Culiacan, Sinaloa, Oct. 24, 1904, *T. S. Brandegee* (type, in Gray Herb.); between Guichocovi and Lagunas, Oaxaca, June 27, 1895, *E. W. Nelson*, no. 2743; Real de Guadelupe, Sept. 14, 1898, *E. Langlassé*, no. 351; near Cuernavaca, Morelos, July 25, 1896, *C. G. Pringle*, no. 7183; near Iguala, Guerrero, Sept. 22, 1905, *C. G. Pringle*, no. 13,681; Yucatan, 1895, *G. F. Gaumer*, no. 790. *H. phyllostachyum* Torr. in its typical form is a low (rarely 1 dm. high) diffusely spreading plant with short broad leaves and inconspicuous flowers, the corolla 1.5–2 mm. long, scarcely exceeding the calyx. It is mostly of more northern range than the variety, although it has been secured at Manzanillo, Colima, by Dr. Palmer (no. 891) and at Guaymas (no. 232). No. 891 is quite typical but no. 232 represents a transition to the variety in its erect habit. Because of these facts it seems best to give the southern plant varietal rather than specific rank.

Omphalodes lateriflora (Aubrey), comb. nov.—*Cynoglossum lateriflorum* Aubrey, Prog. Morb. x. 25 (1801–1803). *O. littoralis* Lehm. Neue Schrift. Nat. Fr. Berl. viii. 98 (1818).

Solenanthus turkestanicus (Reg. & Smirn.), comb. nov.—*Kuschakewiczia turkestanica* Regel & Smirn. Act. Hort. Petrop. v. 626 (1877). *Solenanthus Kuschakewiczi* Lipsky, Act. Hort. Petrop. xxiii. 182 (1904). As Lipsky has well shown, this plant possesses no characters which justify its being maintained as a genus distinct from *Solenanthus* Ledeb. He, however, as indicated above, failed to retain the original specific name.

Solenanthus stamineus (Desf.), comb. nov.—*Cynoglossum stamineum* Desf. Ann. Mus. Par. x. 431 (1807). *Solenanthus Tournefortii* DC. Prod. x. 164 (1846). DeCandolle rightly gives *Cynoglossum stamineum* Bieb. Fl. Taur.-Cauc. iii. 127 (1819) a new name under *Solenanthus*, namely *S. Biebersteinii*, but there seems to be no need for discarding the much earlier *C. stamineum* of Desfontaines.

Lappula laxa (G. Don), comb. nov.—*Cynoglossum laxum* G. Don Gen. Syst. iv. 356 (1838). *C. uncinatum* Royle ex Benth. in Royle, Ill. i. 305 (1839). *Echinospermum glochidiatum* A. DC. Prod. x. 136 (1846). *Paracaryum glochidiatum* Benth. ex Hook. f. Fl. Brit. Ind. iv. 161 (1885). *Rindera glochidiata* Wall. Cat. no. 926, nomen nudum. DeCandolle (l. c.) was the first to assign this plant to its proper genus, but it had been previously published by George Don as indicated above. It is of interest that the specimens in the Gray Herbarium are marked "Good Echinospermum" in Dr. Gray's handwriting.

Lappula Redowskii (Hornem.) Greene, var. **Karelini** (Fisch. & Mey.), comb. nov.— *Echinospermum Karelini* Fisch. & Mey. Ind. Sem. Hort. Petrop. xi. 67 (1846). *E. Redowskii* (Hornem.) Lehm., var. *Karelini* (Fisch. & Mey.) Regel, Act. Hort. Petrop. vi. 341 (1880). As indicated by Regel (l. c.), like the typical form of the species, but having the sides and faces of the nutlets nearly or quite smooth. The related American species, *L. texana* (Scheele) Britton, shows a variation analogous to this.

Lappula omphaloides (Schrenk), comb. nov.— *Echinospermum omphaloides* Schrenk, Bull. phys.-math. Acad. Sci. St.-Pétersb. iii. 211 (1845). I must concur in the opinion expressed by Lipsky, Act. Hort. Petrop. xxvi. 567 (1910), that this is a good species of the genus *Lappula* (*Echinospermum*). The correct combination, however, does not seem to have been made.

Allocarya glabra (Gray), comb. nov.— *Lithospermum glabrum* Gray, Proc. Am. Acad. xvii. 227 (1882). *Allocarya salina* Jepson,

Fl. West.-Middle Calif. ed. 1, 442 (1901). Mrs. Brandegee, Zoe, v. 94–95, called attention to the true relationship of this plant as long ago as 1901, suggesting that it might be an introduction. More recently Prof. Jepson (l. c.) redescribed it from the Alvarado salt marshes. Although the label on Lemmon's specimen (the original) bears the notation "Arizona," the specimen probably came, as Mrs. Brandegee remarks, from California. Dr. Gray compared his species to *L. incrassatum* Guss. which is a good *Lithospermum* and which consequently bears only a superficial resemblance to *A. glabra*. The Old World plant at maturity develops a similarly fistulous-enlarged rhachis and callous-thickened calyx, but it has the fruit, the flowers and the aspect of other members of the genus. The nearest relative of *A. glabra* is *A. stipitata* Greene. Mrs. Brandegee doubts if the former is anything more than "a swollen form" of the latter. The swollen character is a very noticeable, but not by any means, it would seem, the strongest difference. However this may be, *glabra* is the older name and must be used regardless of the disposition one may make of *A. stipitata*.

Allocarya tenuicaulis (Phil.), comb. nov.—*Eritrichium tenuicaule* Phil. Linnaea, xxix. 18 (1857). *E. uliginosum* Phil. Anal. Univ. Santiago, xliii. 519 (1873). *Krynitzkia trachycarpa* Gray, Proc. Am. Acad. xx. 266 (1885). *Allocarya diffusa* Greene, Pitt. i. 14 (1887). When Dr. Gray described this plant (l. c.) he referred to it two Chilian specimens remarking that "it may be suspected to be the *Lithospermum muricatum* of Ruiz & Pavon, and probably it may have other specific names; none of them, however, can be safely adopted." Two years later Dr. Greene (l. c.) transferred the *Krynitzkia* species belonging to his new genus and maintained the name *trachycarpa* "as to the Californian plants only," at the same time making the new combination *A. uliginosa* (Phil.) Greene, with the notation "*Krynitzkia trachycarpa* Gray as to the Chilian specimens doubtless." Reiche in his Flora de Chile (1910) has defined the Allocaryas of that country, and has definitely shown that Ruiz & Pavon's plant is not ours (a conclusion reached by Dr. Greene, l. c.). He treats the North American plant, however, as a synonym of the earlier *E. uliginosum*, thus following the opinion of Dr. Gray, who evidently assigned the new name *trachycarpa* because he had at that time no means of knowing what name should be rightly taken up. The Reed specimen, which he cited, is probably *A. sessiliflora* (Poepp.) Greene, but the Harvey one corroborates Reiche's treatment. Unfortunately this much named plant has never been properly christened even yet. We are given the

synonym *E. tenuicaule* Phil. in the Flora de Chile, but for some reason the author of that work used the much later *E. uliginosum* Phil. It is true that the former name is not desirable but since it is perfectly tenable, it must be used. For the complicated synonymy see the Flora de Chile, where Reiche gives the citations of some of the named forms of this rather variable species.

Allocarya linifolia (Lehm.), comb. nov. — *Anchusa linifolia* Lehm. Asperif. 215, no. 158 (1818). *A. oppositifolia & pygmaea* HBK. Nov. Gen. et Spec. iii. 91–92 (1818). *Krynitzkia linifolia* (Lehm.) Gray, Proc. Am. Acad. xx. 266 (1885). From these names of the same date between which priority cannot be determined I have used the name selected by Dr. Gray (l. c.) and have followed his interpretation of the species. Our specimens are from Peru, Ecuador, and Bolivia.

Allocarya linifolia (Lehm.) Macbr., var. **Kunthii** (Walp.), comb. nov.— *Anchusa Kunthii* Walp. Nov. Act. Nat. Cur. xix. 372 (1843). *Antiphytum Walpersii* A. DC. Prod. x. 122 (1846). *Eritrichium Walpersii* (A. DC.) Wedd. Chlor. And. ii. 90 (1859). The foliar characters given by the authors cited — the much longer and more uniformly linear leaves — seem to be the only differences between this plant and *A. linifolia;* the nutlets are the same.

Eremocarya micrantha (Torr.) Greene, var. **lepida** (Gray), comb. nov.— *Eritrichium micranthum* Torr., var. *lepidum* Gray, Syn. Fl. ii. pt. 1, 193 (1878). *E. lepida* (Gray) Greene, Pitt. i. 59 (1887). The variety is confluent with the species, as pointed out by Dr. Gray, Proc. Am. Acad. xx. 275 (1885). The nutlet variation is nicely illustrated by Abrams's no. 2904, Aug. 5, 1902, which is typical of the variety as first described except that some of the plants have smooth and lustrous nutlets. The description of the species given in the Synoptical Flora calls for either "smooth and shining or dull and puncticulate-scabrous" fruits. In the type-specimens these are smooth and Dr. Rydberg has segregated those having rough nutlets as *E. muricata* Rydb. Bull. Torr. Bot. Club, xxxvi. 677 (1909). Unfortunately a co-type specimen, viz. *Parry*, no. 164, collected in 1874, has perfectly smooth nutlets. Evidently the character has no specific value in this genus, since the large-flowered plant (var. *lepida*) shows the same variation, and since herbarium material seems to indicate that the smooth- and rough-fruited forms grow intermingled. Furthermore, if one maintains the rough-fruited form of the small-flowered plant as a species (*E. muricata*) we need yet another species for the rough-fruited form of the large-flowered plant.

Greeneocharis dichotoma (Greene), comb. nov.—*Krynitzkia dichotoma* Greene, Bull. Calif. Acad. i. 206 (1885). The original collection from western Nevada is the only representation of this species at the Gray Herbarium; other specimens so referred belong rather to the widely distributed and somewhat variable *G. circumscissa* (H. & A.) Rydb. The latter is canescent with a more or less appressed-strigose pubescence, especially on the stems and branches. A plant with fine widely spreading hairs and scarcely, if at all, strigose-canescent has been collected at an elevation of 3050 m., while the typical form seldom attains half this altitude. This high-mountain variation may be known as

GREENEOCHARIS CIRCUMCISSA (H. & A.) Rydb., var. **hispida**, var. nov., hispida vix strigoso-canescens; pilis patentibus.—Specimen examined: CALIFORNIA: trail to Mt. Whitney, August 13, 1904, *Culbertson*, no. 4243 (TYPE, in Gray Herb.).

Plagiobothrys catalinensis (Gray), comb. nov.—*P. arizonicus* (Gray) Greene, var. *catalinensis* Gray, Syn. Fl. ii. pt. 1, 431 (1886). Besides differing from *P. arizonicus* in the open fruiting-calyx with ovate lobes and the duller rougher nutlets (as pointed out by Dr. Gray, l. c.), *P. catalinensis* has other distinguishing features. Mature nutlets are only 1.5 mm. long, dark in color, the rugae obscure and not at all acute, the ventral keel low and narrow, and the caruncle small. Mature nutlets of the former plant are nearly or quite 2.5 mm. long, light (almost white) in color, the rugae very distinct and acute, and the ventral keel and caruncle usually prominent. Moreover the spikes of the mainland plant are usually interruptedly bracteate or even naked above; the spikes of the insular species are uniformly bracteate throughout.

OREOCARYA VIRGATA (Porter) Greene, forma **spicata** (Rydb.), comb. nov.—*O. spicata* Rydb. Bull. Torr. Bot. Club, xxxvi. 678 (1909). Although the surface-character of the nutlets is generally diagnostic in this genus, the smooth-fruited plant represented by the above name is surely not worthy even varietal rank, let alone specific. The nutlets of *O. virgata* vary greatly in the degree of roughness; and plants with more or less roughened fruits and those with perfectly smooth fruits that grow together in the region of Pike's Peak are otherwise indistinguishable.

OREOCARYA MULTICAULIS (Torr.) Greene, var. **cinerea** (Greene), comb. nov.—*O. cinerea* Greene, Pitt. iii. 113 (1896). The only character that distinguishes this is the pubescence. As in the typical form the color of the nutlets and the height of the stems amount to

nothing. It is very doubtful if the several segregate species proposed in this group can be maintained as they are founded on these or other characters equally trivial. However, the variation treated here is so striking in its extreme form that it is worthy varietal designation. Since Dr. Greene failed to indicate any definite specimen, the following representative collections are noted. Specimens examined: COLORADO: plains, Pueblo, 1873, *Edward L. Greene* (TYPE). NEW MEXICO: Mogollon Mountains, on the middle fork of the Gila River, Socorro Co., August 9, 1903, *O. B. Metcalf*, no. 431. ARIZONA: vicinity of Flagstaff, June 4, 1898, *Dr. D. T. MacDougal*, nos. 40, 204. MEXICO: Casas Grandes, Chihuahua, May 13, 1899, *E. A. Goldman*, no. 407.

OREOCARYA SUFFRUTICOSA (Torr.) Greene, var. **abortiva** (Greene), comb. nov.—*O. abortiva* Greene, Pitt. iii. 114 (1896). *Krynitzkia multicaulis* Torr., var. *abortiva* (Greene) Jones, Contrib. W. Bot. xiii. 5 (1910). Jones (l. c.) has pointed out that the incurving of the nutlets is a characteristic common to all members of the group. When only one nutlet forms (as is sometimes the case in this plant and also in others) the ventral keel is larger than when more mature. It then, of course, seems to end even more abruptly. The Californian plant simply represents an extreme in this matter. It is otherwise allied to *O. suffruticosa* rather than to the other species of the group. See the remarks by Parish, Eryth. vii. 95 (1899), which further prove the plant to be unworthy specific rank.

Oreocarya virginensis (Jones), comb. nov.—*Krynitzskia glomerata* (Pursh) Gray, var. *virginensis* Jones, Contrib. W. Bot. xiii. 5 (1910). Very distinct from *O. glomerata*, which has narrowly ovate not at all winged nutlets. Besides the specimens from La Verkin and Diamond Valley, Utah, cited by Mr. Jones, another from the same region, viz.: no. 173 by *Dr. C. C. Parry*, 1874, is of this species.

OREOCARYA SERICEA (Gray) Greene, Pitt. i. 58 (1887).—*O. humilis* (Gray) Greene, l. c. iii. 112 (1896)? *Krynitzkia sericea* Gray, var. *fulvocanescens* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 710 (1895). *Eritrichium glomeratum* (Pursh) DC., var. ? *fulvocanescens* Wats. Bot. King Exped. 243 (1871) in part, not *E. fulvocanescens* Gray, Proc. Am. Acad. x. 61 (1875) i. e. *Krynitzkia echinoides* Jones, l. c. 709. Mr. Jones (l. c.) assigned a new name to the plant collected by Fendler in New Mexico and labeled in herb. by Dr. Gray "*E. fulvocanescens*," on the ground that the name must be applied to a very different plant collected by Watson in Nevada (no. 853), because this was the plant for which the name was first published. It is true that Watson took his no. 853 to be Gray's *fulvocanescens* in herb.; but the first specific

use of the name was by Dr. Gray (l. c.) and although he cited Watson's variety as a synonym his description is entirely based on Fendler's plant. Furthermore, Article 47 of the International Rules states, "When a species.... is divided into two or more groups of the same nature, if one of the forms was distinguished or described earlier than the other, the name is retained for that form." The name *fulvocanescens* must apply, then, to Fendler's plant, since it was first distinguished and first described as a species. Accordingly it is rather the plant collected by Watson and wrongly included by him in his description of *fulvocanescens* as a variety of *glomerata* which needs the new name unless already described. The latter alternative seems to represent the truth. Jones (l. c.) and Greene (l. c. 111) were evidently writing about the same plant; and when Dr. Gray proposed the name *sericea* he included under it his earlier *Eritrichium glomeratum*, var. *humile*. The material in the Gray Herbarium would indicate that he was justified in this; but Dr. Greene in using the name specifically, wrote "*E. glomeratum*, var. *humile* Gray in part." Therefore, if *O. humilis* Greene is distinct from *O. sericea*, the Watson plant from Nevada discussed above must bear the former rather than the latter name.

Oreocarya oblata (Jones), comb. nov.— *Krynitzkia oblata* Jones, Contrib. W. Bot. xiii. 4 (1910). Very distinct from all other species having long white corollas. *O. Shockleyi* Eastw. and *K. mensana* Jones are the only other members of its immediate group. The latter is probably a good species, nearer the former than is *O. oblata*, but I have seen no specimen. *O. oblata* probably is not uncommon in Arizona, New Mexico, and Texas. Specimens examined: TEXAS: among rocks (corolla white), El Paso, March, 1851, *George Thurber*, no. 147, Sept. 1884, *Marcus E. Jones*, 1881, *G. R. Vasey*, March, 1885, *Asa Gray*. NEW MEXICO: 1851–52, *C. Wright*, no. 1566, in part.

CRYPTANTHA BARBIGERA (Gray) Greene, var. **inops** (Brandegee), comb. nov.— *Krynitzkia barbigera* Gray, var. *inops* Brandegee, Zoe, v. 228 (Sept. 1906). Mrs. Brandegee on one of her labels has rightly cited as synonyms of the above variety, *C. nevadensis* Nels. & Kenn. and *C. arenicola* Heller, published two and three months later respectively. The very slender acuminate nutlet is the principal character of the variety. The muriculations, especially near the tip of the fruit, are often very sharp. A specimen collected by Dr. Gray in the Grand Cañon in 1885 and included by him in the species must now be referred to the variety.

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(Continued on page 2 of Cover.)

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New Series.—No. XLVI.

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M. L. Fernald and C. A. Weatherby.

(Plates 114–117.)

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The essentially halophytic genus *Puccinellia* of Parlatore[1] has always been one of the least understood and, even to agrostologists, one of the most perplexing groups of grasses. The species superficially so closely simulate one another that by many experienced botanists they are merged; while the generic status of the plants is often questioned. Thus by some European botanists (for instance, Druce and Ostenfeld) the plants are included under *Glyceria*, by others (as Ascherson & Graebner) treated as a section of *Festuca*, while Britten & Rendle include them in *Sclerochloa*. In some characters species of *Puccinellia* certainly approach all three of these genera, yet as a whole the plants seem to constitute a good genus for which *Puccinellia* is the earliest unequivocal name.

In Europe, however, the name *Puccinellia* is not generally in use; but those who treat the group as a genus (for instance, Briquet, Richter or Rouy) call it *Atropis*. The status of *Atropis* as a generic name is, nevertheless, open to serious doubt. It is commonly cited as dating from Trinius in Ruprecht's *Flores Samojedorum Cisuralensium*,[2] and Grisebach in Ledebour's *Flora Rossica*, but in the enumera-

[1] Parl. Fl. Ital. i. 366 (1848).

[2] Rupr. Beitr. zur Pflanzenk. des Russischen Reiches, ii. 61, 64 (1845).

tion of plants Ruprecht included it, as Trinius [1] had previously done, under *Poa*, indicating *Atropis* [2] as well as *Phippsia, Catabrosa, Arctophila* and *Dupontia* as sections or subgenera, thus:

"311. Poa (Phippsia) algida (R. Br.)."
"312. Poa (Catabrosa) airoides Koel."
"313. Poa (Atropis) distans L."
"314. Poa arctica R. Br."
"315. Poa alpina L."
"316. Poa pratensis L."
"317. Poa (Arctophila) deflexa*."
"325. Poa (Dupontia!) psilosantha*."

On a succeeding page, in a note under *Poa* (*Dupontia*) *pelligera*, Ruprecht made the observation that these various sections differed from one another in certain characters: "Atropis Trin. (P. distans) Catabrosae quoad glumas proxima, spiculas habet (saltem in statu virgineo) lineares, fere teretes;" [3] and "From the condition of the glumes perhaps a series of genera as follows: Dupontia, Arctophila, Poa, Atropis, Catabrosa, Phippsia, Coleanthus." The enumeration of these plants as species of *Poa*, *Poa* (*Atropis*) *distans*, etc. by Ruprecht (or Trinius through Ruprecht) and then the giving on a subsequent page of brief, inadequate characterizations with the suggestion that these sections of *Poa* are "perhaps" genera, does not, it seems to us, clearly establish *Atropis* and others so treated as well published genera dating from 1845. And it is noteworthy that most authors who take up *Atropis* cite not only the Ruprecht reference but the later reference to Grisebach in Ledebour (1853)[4] as validating the genus. Grisebach, in Ledebour, certainly gave a clear generic characterization and treated the species unequivocally as species of *Atropis*, so that *Atropis* as a well published genus should date from Grisebach's treatment in 1853. In 1848, however, Parlatore, with equal clarity and completeness had characterized *Puccinellia* as a genus to include some of the species, *P. distans* and *P. maritima*, later placed by Grisebach under *Atropis:* and it seems to us that the cause of sound nomenclature is best served by maintaining the fully and definitely published *Puccinellia* Parlatore (1848) rather than the inadequately and uncertainly published *Atropis* Trinius in Ruprecht (1845, validated by Grisebach in 1853).

[1] Trin. Gram. Suppl. 68 (1836).
[2] Rupr. l. c. 61 (1845).
[3] Rupr. l. c. 64 (1845).
[4] Griseb. in Ledeb. Fl. Ross. iv. 388 (1853)

In attempting to determine the large collections of *Puccinellia* which have accumulated at the Gray Herbarium, especially from the shores of the Gulf of St. Lawrence, the writers have found it impossible to place many of the plants with the species commonly recognized as occurring in eastern America. It has consequently been necessary, in order to make the identifications of these plants as certain as possible, to study with some thoroughness all the species to which they are nearly related or with which they may be conspecific. This study has been greatly facilitated by the loan, through Dr. J. M. Macoun, of the large northern collections of the Geological Survey of Canada, by Dr. M. O. Malte of his private collections, and, through Mr. Bayard Long, of the representation in the herbarium of the Academy of Natural Sciences of Philadelphia; and we here express our appreciation of the opportunity to examine this most important material which, with the collections of the Gray Herbarium and of the New England Botanical Club, has been the chief basis of our work.

It quickly became apparent that much of the difficulty heretofore experienced in efforts to differentiate the species of *Puccinellia* has arisen through attempts to divide the plants too generally upon the habit of the inflorescence. Many species which in full maturity have the branches of the panicle widely divergent, in the young condition have close inflorescences with ascending or even appressed branches; so that attempts to use this character often lead to confusion. In searching for more fundamental characters which should be constant in all the material of seemingly identical plants many fruitless experiments were made; but finally the results resolved themselves into a series of differential points which seem to be reasonably definite and to divide the complex of material upon natural and geographically consistent lines. These characters have been tested through a prolonged study, which has occupied portions of three years, and although here indicated chiefly for the species which occur in eastern North America (south of Hudson Straits) they will prove important, we are sure, in the differentiation of the species of northwestern North America, Eurasia and the Arctic, in each of which areas there are several species not here discussed.

In the region specially covered by this paper (the area south of Hudson Straits) there are eleven well defined species of *Puccinellia*, each, as already implied, occupying a consistent geographic area. In two species, *P. maritima* and *P. phryganodes*, the anther is 1.5–

2 mm. long, about twice as long as in our other species. The first of these, *P. maritima*, is a plant of the Atlantic coasts of Europe and of eastern America (from Cape Breton to Pennsylvania); the second an Arctic species which extends southward to Labrador and the shores of Hudson Bay.

The remaining species have conspicuously smaller anthers, 0.5–1 mm. long, in only one species very slightly exceeding this measurement. In some of the plants with small anthers the mature caryopsis (and in good specimens of *Puccinellia* some inflorescences are usually mature while others are just expanding) is large, ordinarily more than 2 mm. long, while in others the grains are about 1.5 mm. in length. The measurements of the mature grain, like the measurements of the anthers, prove to be essentially constant in all material which is otherwise consistent and we have consequently used this character as an important one. Another character of as great importance is found in the margin of the lemma; in some species the lemma is entire or with at most one or two coarse teeth, while in others it is as definitely erose-ciliolate or serrulate. Good characters are also found in the palea, especially in the degree of ciliation; and other characters, often less readily described and more subject to variation, in the aspect of the panicle, the smoothness or hispidity of the rhachis and panicle-branches, the length of the glumes, etc.

The present paper, presenting our conclusions regarding the species of *Puccinellia* in northeastern North America obviously does not cover all the species which may possibly be found in the area. This will be apparent from the fact that one Arctic species alone, *P. phryganodes*, has yet been found on the little-explored Labrador Peninsula, but that in Greenland and Arctic America several other distinct species are found, *P. angustata* (R. Br.) Rand & Redfield, *P. arctica* (Hook),[1] *P. Vahliana* (Liebm.) Scribn. & Merrill, etc., any of which may be expected to reach the Labrador Peninsula or Newfoundland. Furthermore, such very limited collecting as has been done at remote points about the Gulf of St. Lawrence and the eastern coast of Newfoundland has brought together five very distinct plants which are unknown elsewhere in the East, and future exploration of the complex flora of these areas will doubtless extend the ranges of these plants and possibly bring to light other localized species.

[1] PUCCINELLIA **arctica** (Hook.), n. comb. *Glyceria arctica* Hook. Fl. Bor.-Am. ii. 248, t. 229 (1840).

In the following synopsis of the species of *Puccinellia* of eastern North America only those species which we know from south of Hudson Straits are included, but in the citation of specimens stations in western North America are often indicated, especially in the cases of newly described or newly interpreted species and varieties. The plates which have been most kindly prepared for us by Mr. R. E. Torrey illustrate details of all the species here included and some which have heretofore been ascribed to the region.

Key to the Species and Varieties of Puccinellia in eastern North America.

A. Anther 1.5–2.2 mm. long.
  Flowering culms tall, 2–8 dm. high: branches of the panicle scabrous: lemmas 4–5 mm. long, pubescent on the nerves below
    1. *P. maritima.*
  Flowering culms low, 0.4–1 dm. high: branches of the panicle smooth: lemmas 2.8–3 mm. long, glabrous. . . . . 2. *P. phryganodes.*

A. Anther 0.5–1 mm. long (1–1.2 mm. in *P. lucida*). B.

B. Grain 1.4–1.7 mm. long. C.

C. Lower branches of the comparatively short panicle (0.2–1.6 dm. long) densely flowered nearly to the base or at least below the middle: lemmas thick and coriaceous, without a broad hyaline tip; the midnerve reaching the apex, often excurrent as a very short mucro.
  3. *P. fasciculata.*

C. Lower branches of the panicle floriferous chiefly above the middle, or, if much below, loosely flowered and the panicle much elongated (2–3 dm. long): lemmas thin and membranaceous in texture (firm in *P. laurentiana* and sometimes in *P. paupercula*), or at least with a broad hyaline tip; the midnerve not excurrent. D.

D. Lemmas erose-ciliolate or serrulate under a lens. E.

E. Glumes and lemmas truncate, erose-ciliolate under a lens.
  Mature panicle broadly ovoid, loose, its branches spreading or reflexed.
    Leaves of the culm 2–6 mm. wide, flat: panicle 0.8–2 dm. long: lemmas 2–2.5 mm. long. . . . . 5. *P. distans.*
    Leaves of the culm 2 mm. wide or less, becoming more or less involute: panicle 4–9 cm. long: lemmas 1.5–2 mm. long. . . . . (5.) *P. distans*, var. *tenuis.*
  Mature panicle slender-cylindric to ellipsoid, dense, its branches erect or ascending. . . . . 6. *P. coarctata.*

E. Glumes and lemmas tapering to an acute or obtusish tip, not truncate, erose-serrulate: panicle-branches erect or ascending, rarely spreading.

Panicle-branches smooth or nearly so: lemmas 2.3–2.8 mm. long, firm in texture. . . . . 7. *P. laurentiana.*

Panicle-branches strongly scabrous: lemmas thin in texture.

Lemmas 2.5–3 mm. long: grain 1.4–1.6 mm. long. 8. *P. macra.*

Lemmas 2 mm. long or less: grain 1–1.2 mm. long. 9. *P. airoides.*

D. Lemmas essentially entire. . . . . 11. *P. paupercula.*

B. Grain 1.8–2.5 mm. long. F.

F. Flowering culms stout: leaves 2.5–6 mm. wide: lower panicle-branches densely floriferous nearly to the base: midrib of the coriaceous lemma prolonged to the apex, often excurrent as a short mucro. . . . . 4. *P. rupestris.*

F. Flowering culms slender: leaves 0.5–2 mm. wide: lower panicle-branches floriferous chiefly above the middle: lemma with hyaline margin; its midrib not excurrent. G.

G. Glumes and lemmas serrulate and erose-ciliolate under a lens.

Gray-green: panicle-branches ascending or spreading, not reflexed, smooth or nearly so: lemmas firm, 2.3–2.8 mm. long. . . . . 7. *P. laurentiana.*

Bright-green: panicle-branches at length reflexed, scabrous: lemmas thin and lustrous, 3–4 mm. long. 10. *P. lucida.*

G. Lemmas essentially entire, not ciliolate.

Lemmas 2–4 mm. long, tapering to a blunt point or obtusish: second glume 2–3 mm. long: panicle 0.2–1.8 dm. long.

Lemmas 2–2.5 mm. long: panicle 1–6 cm. long. 11. *P. paupercula.*

Lemmas 3–4 mm. long: panicle 0.3–1.8 dm. long. (11.) *P. paupercula,* var. *alaskana.*

Lemmas 4.5–6 mm. long, acute or acuminate: second glume 7–9 mm. long: panicle 1–2.5 dm. long. (11.) *P. paupercula,* var. *longiglumis.*

* *Anther* 1.5–2.2 *mm. long: perennials, often stoloniferous late in the season* (*usually after anthesis*).

1. P. MARITIMA (Huds.) Parl. FIGS. 1–6. Coarse; the smooth culms 2–8 dm. high, forming dense clumps: leaves pale, firm, usually involute in age, 0.25–1.7 dm. long; ligule 1–3 mm. long, entire, blunt-pointed: panicle 0.45–2.7 dm. long, usually somewhat exserted; the ascending or finally spreading, but not reflexed, branches and the pedicels scabrous: spikelets 0.5–1.2 cm. long, 4–11-flowered: 1st glume 2.2–3.4 mm. long, 3-nerved, acute; 2d glume ovate, 3–4.5 mm. long, 3-nerved, tapering abruptly to a short apex: lemma 4–5 mm.

long, thick, somewhat coriaceous, 5-nerved, minutely serrulate, obtuse or tapering abruptly to a blunt apex; midnerve prolonged to the apex and with the lateral nerves pubescent below: palea 3.2–3.7 mm. long, lanceolate, tapering to a bidentate tip, ciliate on the nerves; the cilia longest below: anther 1.5–2.2 mm. long: grain 2–2.2 mm. long: repent stolons coarse, rigid, often prolonged to 3–6 dm., developed chiefly from late summer to spring.— Fl. Ital. i. 370 (1848); Watson & Coulter in Gray, Man. ed. 6, 668 (1890); Britton & Brown, Ill. Fl. i. 214 (1896). *Poa maritima* Huds. Fl. Ang. 35 (1762); Eaton, Man. Bot. North. States, ed. 2, 366 (1818); Bigelow, Fl. Bost. ed. 2, 34 (1824); Torrey, Fl. North. U. S. i. 108 (1824); Beck, Bot. U. S., 409 (1833); Wood, Class-book, 447 (1845). *Glyceria maritima* Wahlenb. Fl. Gothob. 17 (1820), *fide* Aschers. & Graebn. Syn. Mitteleur. Fl. ii. Abt. 1, 460; Mert. & Koch in Röhling, Deutschl. Fl. i. 588 (1823); Gray, Man. ed. 2, 560 (1856); Wood, Class-book, ed. of 1877, 799 (1877). *Sclerochloa arenaria*, var. *maritima* Gray, Man. 594 (1848). *Diachroa maritima* Nutt. ex Steud. Nom. ed. 2, i. 497 (1840). *Atropis maritima* Griseb. in Ledeb. Fl. Ross. iv. 389 (1853). *Panicularia maritima* Scribn. Mem. Torr. Bot. Cl. v. 54 (1894).— Coast of Europe; salt marshes and saline or brackish shores, Nova Scotia; and southern Maine to Pennsylvania. Nova Scotia: Louisburg, Cape Breton Island, August 18, 1898, *J. Macoun*, herb. Geol. Surv. Can. no. 21,056; saline marshes, Annapolis, June 26 and 27, 1883, *J. Macoun*, herb. Geol. Surv. Can. no. 29,582. Maine: salt marsh, Cumberland Foreside, July 6, 1906, *E. B. Chamberlain*, no. 825; brackish shore, Great Chebeague Island, Casco Bay, July 2, 1909, *Fernald*, no. 1,346; salt marsh, Pine Point, Scarboro, June 30, 1909, *Fernald*, nos. 1,344, 1,345; Ocean Park, Old Orchard, July 1, 1901, *Kate Furbish;* salt marsh, Wells Beach, July 14, 1894, *J. C. Parlin*, 1898, *Kate Furbish;* sandy shore, Kittery, July 13, 1891, *Fernald*, July 3, 1903, *W. P. Rich.* New Hampshire: Rye, June 14, 1903, *E. F. Williams*, *B. L. Robinson*, no. 683: marsh at Hampton Beach, June 23, 1896, *A. A. Eaton*. Massachusetts: coast of Essex County, *Oakes;* in sand, Plum Island, Newbury, July, 1890, *Raynal Dodge*, June 25, 1912, *A. S. Pease*, no. 13,672; salt marsh back of dunes, Ipswich, July 13, 1913, *F. T. Hubbard*, no. 642; salt marsh, West Manchester, June 20, 1913, *F. T. Hubbard*, no. 577; Beverly, June 15, 1846, *J. A. Lowell* in herb. Bost. Soc. Nat. Hist.; Medford, June 23, 1879, *C. E. Perkins;* Somerville, June 11, 1879, *C. E. Perkins*, July 12, 1887, *F. S. Collins;* salt marshes along the Charles River, Cambridge, *Nuttall et al.;* salt marshes and sandy embankments, Revere, *H. A. Young et al.;* salt marsh and mill pond, Charlestown, June 5, 1889 and June 19, 1883, *C. E. Perkins;* Boston, *Faron et al.;* Soldier's Field, Brighton, June 11, 1902, *A. S. Pease*, no. 1,712; Dorchester, June 5, 1865, *G. G. Kennedy*, June 12, 1887, *J. R. Churchill;* salt marsh, North Scituate, July 3, 1899, *G. G. Kennedy;* near high-tide mark, Arey's Pond, Orleans, August 10, 1913, *J. Murdoch, jr.*, no.

5,235; Barnstable, *C. S. Williamson* in herb. Phil. Acad. RHODE ISLAND: Newport, *J. W. Robbins* in herb. Bost. Soc. Nat. Hist. NEW JERSEY and DELAWARE: very doubtful. In herb. Phil. Acad. there is a mixed sheet containing three labels and collections: (1) an Alaskan species, (2) *P. maritima* from Cambridge, Massachusetts, and (3) several culms of *P. maritima* and a label marked, not in Nuttall's hand, "'P. [oa] maritima? sea-coast N. Jersey & Delaware' (Nutt.)"; but the species does not now seem to be known from south of Rhode Island. PENNSYLVANIA: ballast ground with *P. distans*, Navy Yard, Philadelphia, June 1, 1865, *C. E. Smith* in herb. Phil. Acad.; ballast, Philadelphia, July, 1870, *I. C. Martindale* in herb. Phil. Acad.

The name *Puccinellia maritima* has been applied to various plants in North America, but in its essential characters the coarse species, which abounds on the marshes from southern Maine to Rhode Island (and locally in Nova Scotia and formerly as a ballast plant at Philadelphia), is the only American plant which closely matches the typical British material of *P. maritima*. Our plant is often taller and has larger panicles than the British material, in these characters approaching the large continental extreme which has been called *Atropis Foucaudi* Hackel. The American plant, however, varies so greatly in stature and in size of panicle and of spikelet that we have been unable satisfactorily to divide the material. The species appears to be undoubtedly indigenous on the coasts of Nova Scotia and New England, although sometimes also introduced on ballast; but south of New England it is apparently only a casual plant of ballast lands.

2. P. PHRYGANODES (Trin.) Scribn. & Merr. FIGS. 7–11. Low and slender, forming close mats; the decumbent culms 0.4–1 dm. high: leaves slender, 2–4 cm. long, flat or becoming involute, 0.5–1 mm. wide; ligule 0.5 mm. or less long, truncate: panicle 2–3.5 cm. long, barely exserted, with few smooth short erect branches and pedicels: spikelets 4–6 mm. long, 3–4-flowered: 1st glume 1.3–2 mm. long; the 2d 2.5–3.5 mm. long, obtuse or acutish, entire: lemma 2.8–3 mm. long, firm in texture, 5-nerved, broadly obtuse, entire, or lacerate above, glabrous: palea barely shorter, subtruncate or emarginate, smooth or slightly ciliate-scabrous; the nerves somewhat excurrent: anthers 1.5 mm. long: repent flagelliform bulblet-bearing stolons 1–3.5 dm. long, freely developed especially on sterile plants.— Contrib. U. S. Nat. Herb. xiii. 78 (1910). *Poa phryganodes* Trin. Mém. Acad. St. Pétersb. sér. VI. Math. Phys. Nat. i. 389 (1830 or 1831). *Catabrosa vilfoidea* Anders. in Malmgr. Öfv. Vet. Akad. Förh. xix. 254 (1862). *Molinia distans*, var. *reptans* Hartm. Excursions-fl. 17 (1846). *Glyceria vilfoidea* Fries, Öfv. Vet. Akad. Förh. xxvi. 139

(1869). *G. reptans* Krok, Bot. Not. 140 (1899). *G. maritima*, var. *reptans* Simmons, Vasc. Pl. Ellesmereland, 159 (1906). *Atropis vilfoidea* Rowlee & Wiegand, Bot. Gaz. xxiv. 422 (1897).— Arctic regions, south to Labrador, Keewatin, and the Bering Sea region. LABRADOR: Nain, August 11, 1897, *J. D. Sornborger*, no. 237. KEEWATIN: Cape Henrietta Maria, Hudson Bay, August 18, 1904, *W. Spreadborough*, herb. Geol. Surv. Can. no. 62,742. ALASKA: abundant on saline mud flats, but no flowering plants found, St. Paul Island. July 31, 1897, *J. M. Macoun*, herb. Geol. Surv. Can. no. 16,223; originally described from Kotzebue Sound, and recently collected (acc. to Scribner & Merrill, Contrib. U. S. Nat. Herb. xiii. 78) on the Seward Peninsula.

The numerous flagelliform stolons are very characteristic of this northern species, but they should not be taken as an absolute diagnostic character since *P. paupercula* and its var. *alaskana* occasionally have stolons which in all characters appear inseparable from those of *P. phryganodes*. The identification of these plants by the stolons alone is not final and the difficulty of accurate determination is rendered greater since the stoloniferous colonies are so frequently destitute of inflorescences.

* * *Anther* 0.5–1 (*rarely* 1.2) *mm. long.*

+ *Lemma thick and coriaceous; its mid-nerve often excurrent: lower branches of the panicle densely-flowered to below the middle: annuals or biennials.*

3. P. FASCICULATA (Torr.) Bicknell. FIGS. 12–16. Rather coarse; the smooth mostly geniculate culms 1.5–8 dm. high: leaves 2–6 mm. broad, flat, or finally involute: panicle long-exserted, ellipsoid to ovoid, 0.2–1.6 dm. long, contracted; the ascending or slightly spreading sparingly scabrous branches floriferous nearly to the base: spikelets 3–4 mm. long, 2–5-flowered: glumes minutely serrulate but not ciliate; the 1st 0.75 mm. long, oblong-ovate, acutish, 1-nerved; 2d 1.5 mm. long, broadly ovate, acutish, with 3 prominent nerves: lemma 2–2.5 mm. long, firm, ovate, obtuse, or acutish, minutely serrulate, pubescent at base, 5-nerved: palea slightly shorter, oblong, blunt and erose at the slightly narrowed apex, ciliate on the nerves: anther 0.5–0.8 mm. long: grain 1.4 mm. long.— Bull. Torr. Bot. Cl. xxxv. 197 (1908); Nash in Britton & Brown, Ill. Fl. ed. 2, i. 268 (1913). *P. Borreri* Hitchc. RHODORA, x. 65 (1908); Nash in Britton & Brown, l. c. (1913). *Poa fasciculata* Torr. Fl. North. U. S. i. 107 (1824); Eaton, Man. ed. 5, 333 (1829); Beck, Bot. North. and Mid. States, 409 (1833); Wood, Class-book, 447 (1845). *P. delawarica* Link, Hort. Berol. i. 174 (1827). *P. Borreri* Hook. & Arn. Brit. Fl. ed. 8, 549 (1860). *Festuca (?) delawarica* Kunth, Gram. i. 129 (1829).

F. Borreri Bab. Trans. Linn. Soc. xvii. 565 (1837). *Glyceria Borreri* Bab. in Engl. Bot. Suppl. iii. t. 2797 (1837). *G. distans* Gray, Man. ed. 2, 560 (1856), as to synonym *Poa fasciculata* Torr., not as to description; Wood, Class-book, ed. of 1877, 799 (1877), at least in part. *Scleroch-loa Borreri* Bab. Man. Brit. Bot. 370 (1843). *S. arenaria,* var. *fasci-culata* Gray, Man. 594 (1848). *Atropis Borreri* Richter, Pl. Eur. i. 92 (1890).— Coasts of Europe; Massachusetts to Delaware, indige-nous, and sometimes adventive from Europe; Utah. MASSACHU-SETTS: salt marshes, Massachusetts, *C. Pickering* in herb. Phil. Acad.; Plum Island, Newbury, *Oakes;* beach, Brant Point, Nantucket, June 22, 1909, *N. F. Flynn* in herb. Bost. Soc. Nat. Hist. RHODE ISLAND: salt marsh, East Providence, May 30, 1911, *K. M. Wiegand,* no. 931; Wickford, June 17, 1908, *G. G. Kennedy, E. F. Williams.* CONNECTICUT: sandy place by salt marsh, West Haven, June 23, 1912, *A. E. Blewitt,* no. 339; edge of salt marsh, Woodmont, June 13, 1908, *Eames & Godfrey,* no. 5,922; salt marsh coated with sand, Orange, June 23, 1912, *C. H. Bissell;* moist sand bordering salt marsh, Stratford, June 12, 1908, *E. H. Eames,* no. 5,915, July 6, 1912, *A. E. Blewitt,* no. 355; sandy shores of Cedar Creek, Bridgeport, June 29, 1899, *Eames;* sandy border of salt meadows, within tidal influence, Westport, June 19, 1901, *Eames,* no. 160. NEW YORK: salt marshes in vicinity of New York, *Torrey* (TYPE of the species); New Lots, Long Island, June 11, 1887, *N. L. Britton.* NEW JERSEY: coast, *Nuttall;* coast, August, 1833, *A. Gray;* Hoboken, *Thurber;* Somer's Point, June, 1865, *C. E. Smith* in herb. Phil. Acad.; salt marsh, Cape May, May–July, *A. H. Smith et al.* in herb. Phil. Acad.; Swedesboro, June 2, 1895, *C. D. Lippencott* in herb. Phil. Acad.; Kaign's Point, *D. Burke* in herb. Phil. Acad. PENNSYLVANIA: Phila-delphia (various stations), *Leidy et al.* in herb. Phil. Acad. DELA-WARE: coast, *Nuttall* in herb. Phil. Acad.; Cape Henlopen, *A. H. Smith* in herb. Phil. Acad.; salt marshes, Woodland Beach, June 30, 1898, *A. Commons* in herb. Phil. Acad. UTAH: Hot Springs, June 19, 1908, *Mrs. Joseph Clemens* (distributed as *Agrostis stolonifera*).

Though occasionally found on ballast and there presumably a recent introduction from Europe, *P. fasciculata* is clearly indigenous upon our coast as well as in Europe. Its status in Utah is yet to be determined, but there it is probably a recent introduction.

4. P. **rupestris** (With.), n. comb. FIGS. 17–22. Resembling *P. fasciculata;* the decumbent culms 1–4.2 dm. high: leaves 2.5–6 mm. wide, flat: panicle ellipsoid, glaucous, 2–7 cm. long; the branches stiff and approximate, 1–2.5 cm. long, closely flowered nearly to base, distichous, scabrous: spikelets 5–8 mm. long, 3–5-flowered: 1st glume 1.5–2 mm. long, ovate, acutish, 3-nerved; the midnerve scabrous: 2d glume 2–2.5 mm. long, oval, obtuse, 3-nerved, hyaline and erose-serrulate above: lemma 3–3.5 mm. long, ovate, obtuse, thick and firm except at the narrow hyaline summit, essentially entire or minutely

serrulate at summit; the midnerve often excurrent and minutely scabrous at tip, with a few hairs at base: palea slightly shorter, linear-oblong, scarcely tapering to the bidentate or fimbriate summit, ciliate to the base with slender hairs of about uniform length: anther 0.8–1 mm. long: grain 2 mm. long.— *Poa rupestris* With. Arr. Brit. Pl. ed. 3, ii. 146, t. 26 (1796). *Poa procumbens* Curtis, Fl. Lond., fasc. vi. t. 11 (Exact date of publication not known but probably later than Withering's species. See note below). *Sclerochloa procumbens* Beauv. Agrost. 98 (1812). *S. rupestris* Britten & Rendle, Journ. Bot. xlv. 107 (1907). *Glyceria procumbens* Sm. Engl. Fl. i. 119 (1824). *Festuca procumbens* Kunth, Gram. i. 129 (1829). *Atropis procumbens* Thurb. Bot. Cal. ii. 309 (1880); Beal, Grasses Am. ii. 575 (1896).— Atlantic coast of Europe; adventive in America. Occasionally reported on ballast. Seen by us only from NEW YORK: ballast, New York, June, 1880, *Addison Brown*. NEW JERSEY: ballast, Kaign's Point, *D. Burke* in herb. Phil. Acad.; Petty's Island, July 3, 1867, *Burke* in herb. Phil. Acad.

Britten & Rendle give excellent reasons for concluding that *Poa rupestris* With. was published earlier than *P. procumbens* Curtis:— see Journ. Bot. xlv. 107 (1907). In addition to their reasoning it may be noted that Withering, in his original description (ed. 3) states merely that the plant was "Gathered on St. Vincent's Rocks, near Bristol, by Mr. Milne, who observed to me that Mr. Curtis first found it there." In his 4th edition, ii. 147 (1801) he adds, "Sir THOMAS FRANKLAND found this plant growing on the waste ground near the Dock, betwixt Bristol and the Hotwells. Also on the new Pier at Scarborough." This additional information is given in Curtis's publication and presumably taken from it by Withering (though he makes no acknowledgment) and the natural inference is that Curtis's species was published after Withering's 3rd edition and before the 4th. Also, Withering cites "Curt." in edition 4, not in edition 3.

+ + *Lemma not coriaceous; its midnerve not excurrent: lower branches of the panicle floriferous chiefly above the middle, if below loosely flowered and the panicle much elongated* (2–3 dm. long): *plants mostly perennial.*

++ *Lemmas and glumes erose-serrulate or ciliolate.*

= *Lemmas truncate-obtuse and erose-ciliolate at the broad tip, with a few hairs at base.*

5. P. DISTANS (L.) Parl. FIGS. 23–27. Culms 2–6 dm. high, rather slender: leaves green, rarely glaucous, 3.5–10 cm. long, 2–6 mm. broad, flat: panicle green or violet-tinged 0.8–2 dm. long, ovoid, lax; the

lower branches 0.3–1.3 dm. long, at first ascending, then divergent, finally deflexed, floriferous chiefly above the middle; pedicels scabrous or smoothish: spikelets 4–5 mm. long, 4–6-flowered: 1st glume 1 mm. long, 1-nerved, ovate, acutish to obtuse, minutely erose-ciliolate; 2d 2 mm. long, broadly ovate, erose-ciliolate, 3-nerved, the lateral nerves short and faint: lemma 2–2.5 mm. long, broadly ovate, faintly 5-nerved, hyaline above, obtuse or subtruncate, with a few hairs at base: palea slightly shorter, ciliate in the upper half on the marginal nerves, truncate-emarginate and erose-ciliolate at apex: anther 0.7–0.9 mm. long: grain 1.4 mm. long.— Fl. Ital. i. 367 (1848); Watson & Coulter in Gray, Man. ed. 6, 668 (1890); Britton & Brown, Ill. Fl. i. 214 (1896). *Poa distans* L. Mant. i. 32 (1767). *Glyceria distans* Wahlenb. Fl. Ups. 36 (1820); Gray, Man. ed. 2, 560 (1856), as to description. *Festuca distans* Kunth, Gram. i. 129 (1829). *Sclerochloa distans* Bab. Man. Brit. Bot. 370 (1843). *Atropis distans* Griseb. in Ledeb. Fl. Ross. iv. 388 (1853); Beal, Grasses Am. ii. 572 (1896). *Panicularia distans* Scribner, Mem. Torr. Bot. Cl. v. 54 (1894).— Eurasia and northern Africa; adventive and rapidly becoming naturalized in North America; less pronouncedly halophytic than most species. Quebec: damp magnesian gravel and mud about the asbestos quarries, Black Lake, Megantic County, August 26, 1915, *Fernald & Jackson*, no. 12,022. New Brunswick: waste ground, Pointe du Chêne, July 12, 1912, *Bartram & Long*, no. 6,919; St. John, August, 1877, *J. Fowler* in herb. Phil. Acad.; salt marshes, Carleton, September, 1877, *Fowler*. Nova Scotia: damp roadside, Sydney, Cape Breton Island, August 17, 1902, *Fernald;* ballast-heaps, Pictou, July 24, 1883, *J. Macoun*, herb. Geol. Surv. Can. no. 29,598; brackish soil, Windsor, August 22, 1902, *Fernald*. Maine: wharves and roadsides, Rockland, August 22, 1909, *Fernald*, no. 1,343. Massachusetts: Oak Island, Revere (only 1 bunch), June 15, 1908, *G. G. Kennedy;* Charlestown, June 5, 1880 and June, 1883, *C. E. Perkins;* Boston, June 28, 1879, *Faxon;* waste wet ground, South Boston, June 18, 1900, *W. P. Rich;* roadsides, North Adams, June 23 and 25, 1913, *Fernald & Long*, no. 8,798. Connecticut: borders of marshes, Orange, July 25, 1894 and June 20, 1899, *C. H. Bissell;* meadow on coast, in rather dry soil, Bridgeport, June 14, 1912, *E. H. Eames*, no. 8,528. New York: on refuse from chemical works, flats along Onondaga Lake, Syracuse, July 13, 1915, *Bissell, Ware & Weatherby*. New Jersey: wet soil near edge of marsh, Cape May, May 27 and June 10, 1911, *O. H. Brown* in herb. Phil. Acad. Pennsylvania: Navy Yard, Philadelphia, June 1, 1865, *C. E. Smith* in herb. Phil. Acad. Delaware: waste places, Wilmington, June 4, 1897, *A. Commons* in herb. Phil. Acad. Nevada: meadow near Sparks, Washoe County, June 28, 1907, *A. A. Heller*, no. 8,655 (distributed as *P. Lemmoni*); Glendale, Washoe County, June 28, 1907, *P. B. Kennedy*, no. 1,577.

Var. **tenuis** (Uechtritz), n. comb. Leaves of the culm 2 mm. wide

or less, becoming more or less involute: panicles 4–9 cm. long: lemmas 1.5–2 mm. long.— *Glyceria distans*, forma or var. *tenuis* Uechtritz in Crépin, Notes Pl. Rar. Belg. 229 (1865). *Atropis distans*, *β. tenuis* Rouy, Fl. France, xiv. 195 (1913).— Eurasia; naturalized in North America. NEW BRUNSWICK: ballast-wharf, St. John, June 27, 1904, *Fernald*. MASSACHUSETTS: dry banks of Lynnway, West Lynn, June 18, 1913, *F. T. Hubbard*, no. 565. ONTARIO: Galt, August 24, 1901, *W. Herriot*, herb. Geol. Surv. Can. no. 26,161; along the Canadian Pacific Railway, Owen Sound, September 2, 1901, *J. Macoun*, herb. Geol. Surv. Can. no. 26,228; marshes, Sandwich, July 28, 1901, *J. Macoun*, Herb. Geol. Surv. Can. no. 26,219. ALBERTA: Calgary, August 7, 1915, *M. O. Malte*. IDAHO: roadsides, Boise, August 18, 1911, *June A. Clark*, no. 250, *Nelson & Macbride*, no. 250. WASHINGTON: in alkali soil, Yakima City, July 10, 1897, *Piper*, no. 2,590.

6. P. **coarctata**, n. sp. FIGS. 28–32. Caespitosa perennis 0.8–3 dm. alta glaucescens; culmis glabris tenuibus; foliorum caulinorum laminis planis 1–2 mm. latis 0.2–1 dm. longis; paniculis in anthesi coarctatis 2–7 cm. longis deinde sublaxis ramis inferioribus 1–3 cm. longis laxe adscendentibus, pedicellis paullo scabris; spiculis 3.5–5 mm. longis laxe 3–4-floris; glumis ovatis, inferiore 0.5–1 mm. longa 1-nervata, superiore lata 1.5–2 mm. longa 3-nervata supra hyalina ciliolata; lemmatibus ad basim sparse pilosis 2–2.5 mm. longis late ovatis obtusis supra hyalinis ciliolatis obscure 4–5-nervatis; palea 2 mm. longa oblongo-lanceolata ad apicem latum subtruncata vel bidentata, nervis sparse ciliatis; antheris 0.5–0.8 mm. longis; caryopsibus 1.4–1.7 mm. longis.

Caespitose perennial 0.8–3 dm. high, somewhat glaucous: culms glabrous, slender: cauline leaves with flat blades 1–2 mm. wide, 0.2–1 dm. long: panicles dense in anthesis, 2–7 cm. long, finally somewhat lax; the lower branches 1–3 cm. long, loosely ascending; pedicels slightly scabrous: spikelets 3.5–5 mm. long, loosely 3–4-flowered: 1st glume 0.5–1 mm. long, 1-nerved, ovate; 2d 1.5–2 mm. long, 3-nerved, broadly ovate, hyaline and ciliolate above: lemma sparsely pilose at base, 2–2.5 mm. long, broadly ovate, obtuse, hyaline and ciliolate above, obscurely 4–5-nerved: palea 2 mm. long, oblong-lanceolate, subtruncate or bidentate at the broad apex, sparingly ciliate on the nerves: anthers 0.5–0.8 mm. long: grain 1.4–1.7 mm. long.— Coasts of Labrador, Newfoundland and eastern Quebec. LABRADOR: Seal Island, August 12, 1892, *Waghorne*, herb. Geol. Surv. Can. no. 13,161; waste places near salt water and rocks by sea, Battle Harbor, August 6–13, 1911, *C. S. Williamson*, no. 681 in herb. Phil. Acad. NEWFOUNDLAND: brackish shore of Dildo Run, Notre Dame Bay, July 7, 1911, *Fernald, Wiegand & Bartram*, no. 4,655 (TYPE in Gray Herb.); Barred Islands, Notre Dame Bay, August 12, 1903, *J. D. Sornborger:* Funk Island, August 1, 1908, *H. S. Forbes;* crevices of damp sea-cliff, Torbay, August 21–26, 1901, *Howe & Lang*, no. 1,370;

conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, July 23, 1910, *Fernald & Wiegand*, no. 2,615a. QUEBEC: rocky shore, Pointe Jones, Brest, Saguenay County, July 29, 1915, *St. John*, herb. Geol. Surv. Can.; rocky bank, Romaine, Lagordendière, Saguenay County, July 7, 1915, *St. John*, herb. Geol. Surv. Can.

Superficially resembling the Greenland P. **vaginata** (Lange), n. comb.= *Glyceria vaginata* Lange, Fl. Dan. t. 2583 (1858); but differing in its shorter spike (in *P. vaginata* 5–6-flowered), shorter nearly glabrous lemmas, which in *P. vaginata* are 3 mm. long and distinctly appressed-pubescent along the lower half of the nerves, and in the shorter and broader-tipped palea.

= = Lemmas narrowed to an acute or obtuse tip, not truncate, appressed-pubescent on the nerves below.

° Plant whitish-green: panicle-branches smooth or nearly so: lemmas firm.

7. P. **laurentiana**, n. sp. FIGS. 33–38. Laxe caespitosa perennis 1–3 dm. alta rigida glauca; foliorum caulinorum laminis 3–6 cm. longis involutis, vaginis basilaribus albo-brunneis; ligula 1.5 mm. longa acutiuscula; panicula 0.6–1.3 dm. longa, ramis rigidis glabriusculis adscendentibus deinde divergentibus vix deflexis; spiculis 4–6.5 mm. longis 3–5-floris albescentibus; gluma inferiore 1–2 mm. longa anguste ovata acuta 1-nervata eroso-serrulata, superiore 2–2.5 mm. longa late ovata ad apicem subacutum abrupte angustata eroso-serrulata 3-nervata nervis lateralibus brevibus; lemmatibus ovatis supra hyalinis 2.3–2.8 mm. longis abrupte acuminatis eroso-ciliolatis, nervis basim versus valde pubescentibus, nervo medio ad apicem plerumque scabriusculo; palea paullo breviore lanceolata ad apicem latum bidentata supra scabra basi ciliata; antheris 0.7–0.9 mm. longis; caryopsibus 1.5–1.8 mm. longis.

Loosely caespitose perennial 1–3 dm. high, rigid, glaucous: cauline leaves with the blades 3–6 cm. long, involute; the basal sheaths whitish-brown; ligule 1.5 mm. long, acutish: panicle 0.6–1.3 dm. long; its branches rigid, nearly glabrous, ascending or finally divergent but not deflexed: spikelets 4–6.5 mm. long, 3–5-flowered, whitish: 1st glume 1–2 mm. long, narrowly ovate, acutish, 1-nerved, erose-serrulate; the 2d 2–2.5 mm. long, broadly ovate, abruptly narrowed to the acute apex, erose-serrulate, 3-nerved, the lateral nerves short: lemmas ovate, hyaline above, 2.3–2.8 mm. long, abruptly acuminate, erose-ciliolate, very pubescent on the nerves below; the midnerve often finely scabrous toward the apex: palea a little shorter, lanceolate, bidentate at the broad apex, scabrous above, ciliate at base: anthers 0.7–0.9 mm. long: grain 1.5–1.8 mm. long.— Coasts of Bona-

venture and Rimouski Counties, QUEBEC: gravelly beach, Tracadigash Point, Carleton, July 22, 1904, *Collins & Fernald* (TYPE in Gray Herb.), July 25, 1904, *Collins & Pease* (*Pease*, no. 4,326); gravelly shore, Pointe aux Corbeaux, Bic, July 6–10, 1905, *Williams, Collins & Fernald.*

Superficially resembling *P. coarctata* and *P. vaginata.* Differing from both in the abruptly acuminate firm whitish lemmas and stiff involute leaves, and from *P. coarctata* also in the pubescent nerves of the lemmas.

°° *Plant bright-green or only slightly glaucous: panicle-branches strongly scabrous: lemmas thin.*

8. P. **macra**, n. sp. FIGS. 39–43. Caespitosa perennis (?) 4.5–6 dm. alta viridis; foliorum caulinorum laminis tenuibus planis 3–6.3 mm. latis 0.4–1.4 dm. longis superioribus longioribus, vaginis basilaribus purpurascentibus, ligula 1.5 mm. longa obtusa; panicula lineari-cylindrica 2–3 dm. longa ante et post anthesin erecta basi vagina superiore incluso, ramis filiformibus arcte adscendentibus scaberrimis; spiculis 4–7 mm. longis 4–6-floris purpurascentibus; gluma inferiore 1.5–2 mm. longa hyalina acuta 1-nervata paullo serrulata, superiore 2–2.5 mm. longa anguste ovata obtusa eroso-serrulata 3-nervata, nervo medio ad apicem minute scabro; lemmatibus 2.5–3 mm. longis ovatis obtusis tenuibus supra hyalinis minute eroso-serrulatis 5-nervatis, nervis basin versus pubescentibus; palea 2.5–3 mm. longa oblanceolata bidentata nervis ciliatis, ciliis imis longioribus; antheris 0.9–1 mm. longis; caryopsibus 1.4–1.6 mm. longis.

Caespitose perennial (?) 4.5–6 dm. high, green: cauline leaves with blades thin, flat, 3–6.3 mm. wide, 0.4–1.4 dm. long; the upper longer than the lower; basal sheaths purplish; ligule 1.5 mm. long, obtuse: panicle linear-cylindric, 2–3 dm. long, before and after anthesis erect, the base included in the upper sheath; the branches filiform, strongly ascending, very scabrous: spikelets 4–7 mm. long, 4–6-flowered, purplish: 1st glume 1.5–2 mm. long, hyaline, acute, 1-nerved, slightly serrulate; 2d 2–2.5 mm. long, narrowly ovate, obtuse, erose-serrulate, 3-nerved, the mid-nerve minutely scabrous above: lemmas 2.5–3 mm. long, ovate, obtuse, thin, hyaline above, minutely erose-serrulate, 5-nerved, the nerves pubescent toward the base: palea 2.5–3 mm. long, oblanceolate, bidentate, ciliate on the nerves, the cilia longer below: anthers 0.9–1 mm. long: grain 1.4–1.6 mm. long.— Known only from the type station near the tip of the Gaspé Peninsula, QUEBEC: wet springy place, Bonaventure Island, August 7 and 8, 1907, *Fernald & Collins*, no. 891 (TYPE in Gray Herb.).

A rather unique plant, perhaps nearest to the local *P. nutkaensis* of Vancouver Island, from which it differs in its softer and more pubescent lemmas.

9. P. AIROIDES (Nutt.) Wats. & Coult. FIGS. 44–48. Caespitose, green or slightly glaucous; the culms slender, 2–9 dm. high: cauline leaves flat or becoming involute, 1–2 mm. wide, 2–12 cm. long: panicle 0.4–3 dm. long, from narrow and close to broad and open, the branches and pedicels strongly scabrous; the lower branches (up to 1.2 dm. long) ascending to spreading: spikelets 3.5–7 mm. long, 3–6-flowered: glumes thick, erose-ciliolate; the 1st 1.2–1.5 mm. long, narrowly ovate, acutish, 1-nerved; the 2d 1.5–2 mm. long, 3-nerved, broadly ovate, obtuse or subacute: lemmas 1.5–2 mm. long, ovate, rather abruptly contracted to a blunt or subacute apex, not truncate, thin, hyaline above, erose-serrulate, 5-nerved; the nerves pubescent below the middle: palea lanceolate, about equaling the lemma or slightly longer, ciliate on the nerves chiefly of the upper half; the lower cilia longer: anthers 0.6–0.7 mm. long: grain 1–1.2 mm. long.— Watson & Coulter in Gray, Man. ed. 6, 668 (1890); Britton & Brown, Ill. Fl. i. 215 (1896); Rydberg, Fl. Col. 48 (1906); Coulter & Nelson, Man. Bot. Rocky Mts., 74 (1909); Wooton & Standley, Contrib. U. S. Nat. Herb. xix. 104 (1915). *P. Nuttalliana* Hitchc. in Jepson, Fl. Cal. pt. 3, 162 (1912). *Poa airoides* Nutt. Gen. i. 68 (1818); Eaton, Man. ed. 5, 335 (1829). *Poa Nuttalliana* Schultes, Mant. ii. 303 (1824). *Festuca* (?) *Nuttalliana* Kunth, Gram. i. 129 (1829). *Glyceria montana* Buckley, Proc. Acad. Sci. Phila. 1862, 96 (1863). *G. airoides* Gray, Proc. Acad. Sci. Phila. 1862, 336 (1863). *G. distans* Torr. Bot. Wilkes Exped. 490 (1874); Coulter, Man. Bot. Rocky Mts. 423 (1885); not Wahlenb. *Panicularia distans airoides* Scribn. Mem. Torr. Bot. Cl. v. 54 (1894). *Atropis airoides* Holm, Bot. Gaz. xlvi. 427 (1908).— Widely distributed in the western and west-central sections of North America; adventive eastward to New England. MAINE: around wool-waste, North Berwick, June and July, 1897–1903, *J. C. Parlin*. VERMONT: Canadian Pacific Railway yards, Newport, July 26, 1904, *A. A. Eaton*, no. M226.

The synonym *Glyceria montana* is here ascribed to Buckley as author, although it is well known [1] that Buckley appropriated an unpublished herbarium-name of Nuttall's. This historical fact does not, of course, alter the bibliographic fact that the name, wisely left unpublished by Nuttall, was actually published by Buckley and as a published name should consequently be cited from his publication and not as of Nuttall.

10. P. **lucida**, n. sp. FIGS. 54–58. Laxe caespitosa 1.5–7 dm. alta viridis; foliorum caulinorum laminis 4.6–12 cm. longis involutis flaccidis, vaginis basilaribus plus minusve purpurascentibus; ligula 1.7–2.5 mm. longa acuta; panicula diffusa 1–2.5 dm. longa, basi vagina supe-

[1] See Gray, Proc. Acad. Sci. Phila., 1862, 336 (1863).

riore plerumque inclusa, ramis filiformibus scabris laxe divergentibus deinde deflexis; spiculis 5–9 mm. longis 3–5-floris pallide viridibus; glumis tenuibus lucidis, inferiore 2–3.5 mm. longa ovata acuta supra hyalina minute serrulata nervo medio scabro, superiore 2.5–4 mm. longa 3-nervata nervis evidentibus; lemmatibus 3–4 mm. longis 5-nervatis late ovatis acutis eroso-ciliolatis basin versus valde pubescentibus, pilis longis; palea 2.5 mm. longa lanceolata ad apicem latum bidentata supra scabra basi ciliata; antheris 1–1.2 longis; caryopsibus 1.8–2 mm. longis.

Loosely caespitose, 1.5–7 dm. high, green: cauline leaves with blades 4.6–12 cm. long, involute, flaccid; the basal sheaths more or less purplish; ligule 1.7–2.5 mm. long, acute: panicle diffuse, 1–2.5 dm. long, the base commonly included in the upper sheath; branches filiform, scabrous, loosely divergent, finally deflexed: spikelets 5–9 mm. long, 3–5-flowered, pale-green: glumes thin, lustrous; the 1st 2–3.5 mm. long, ovate, acute, hyaline above and minutely serrulate, with the midnerve scabrous; 2d 2.5–4 mm. long, 3-nerved; the nerves evident: lemmas 3–4 mm. long, 5-nerved, broadly ovate, acute, erose-ciliolate, strongly pubescent toward the base with long hairs: palea 2.5 mm. long, lanceolate, bidentate at the broad apex, scabrous above, ciliate below: anthers 1–1.2 mm. long: grain 1.8–2 mm. long.—Sea shores and damp (presumably alkaline) soil, Quebec, Wyoming and British Columbia. QUEBEC: brackish gravelly shore, Cacouna, August 8, 1902, *Fernald* (TYPE in Gray Herb.); mouth of Rivière du Loup, 1860, *Chas. Pickering:* salt marsh near the wharf, Ste. Anne, Kamouraska County, July 21, 1907, *F. F. Forbes;* Murray River, August 14, 1905, *J. Macoun,* herb. Geol. Surv. Can. no. 69,217 (material under no. 69,217 in Gray Herb. from "Vicinity of Cap à l'Aigle" is partly *P. lucida,* partly *P. paupercula,* var. *alaskana*). WYOMING: in the margins of ponds, Mammoth Hot Springs, July 30, 1899, *A. & E. Nelson,* no. 6,017; damp soil, Washington Ranch, June 29, 1901, *Merrill & Wilcox,* no. 63. BRITISH COLUMBIA: salt marshes, Newcastle Island, Departure Bay, July 10, 1908, *J. Macoun,* herb. Geol. Surv. Can. no. 81,001.

In some characters related to each of the three species, *P. laurentiana, P. macra* and *P. airoides.* From *P. laurentiana* and *P. airoides* separated at once by the longer, thin, lustrous lemmas; from the former also by its capillary widely divergent and very scabrous panicle-branches and the softer greener foliage; from the latter by the longer grain and the commonly less exserted panicle. From *P. macra* at once distinguished by the diffuse panicle, pale spikelets, involute leaves and longer lemmas and achenes.

++ ++ *Lemmas entire or at most remotely few-toothed, not ciliolate.*

11. P. **paupercula** (Holm), n. comb. FIGS. 63–67. Densely caespitose; culms slender, often geniculate, 0.2–2 dm. high: cauline leaves with blades 1–4 cm. long, soft, flat, 0.5–1.5 mm. wide; ligule less than 1 mm. long, acutish: panicle 1–6 cm. long; the few smooth or smoothish branches ascending, in age slightly spreading: spikelets 3–5 mm. long, 2–5-flowered: 1st glume 1–1.5 mm. long, 1-nerved, obtuse or acutish, entire; 2d 2–2.5 mm. long, 3-nerved, entire or obscurely dentate, tapering to a blunt apex: lemmas 2–2.5 mm. long, 5-nerved, tapering to a blunt apex, entire, minutely pubescent at base: palea about equaling the lemma, linear-lanceolate, truncate or somewhat bidentate at apex, slightly scabrous on the nerves above: anthers 0.5–0.7 mm. long: grain about 2 mm. long.— *P. maritima*, var. (?) *minor* Watson in Gray, Man. ed. 6, 668 (1890), as to description and Labrador plant. *Glyceria paupercula* Holm in Fedde, Repert. Spec. Nov. iii. 337 (1907).— Coasts of Labrador, Keewatin, Newfoundland and Quebec.—LABRADOR: Mansfield Island, 1884, *R. Bell* in herb. Geol. Surv. Can., no. 34,782 (TYPE of the species); Hopedale, August 4–6, 1897, *J. D. Sornborger*, no. 238 (transitional to var. *alaskana*); dry rocks, Battle Harbor, August 6, 1911, *C. S. Williamson*, no. 552 in herb. Phil. Acad.; on rocks by the sea, Blanc Sablon, July 30, 1910, *Fernald & Wiegand*, no. 2,616. KEEWATIN: Rankin Inlet, lat. 62° 45′, August 30, 1910, *J. M. Macoun*, herb. Geol. Surv. Can. nos. 79,116, 79,117. NEWFOUNDLAND: gravelly beach, Norris Arm, August 21, 1911, *Fernald & Wiegand*, no. 4,657; forming extensive turf-areas, salt marsh, Killigrew's, August 3, 1911, *Fernald & Wiegand*, no. 4,656. QUEBEC: Salmon Bay, "Labrador," July 28, 1882, *J. A. Allen* (type of *P. maritima*, var. (?) *minor*); salt marsh, Ile du Petit Rigolet, Archipel de Kécarponi, Saguenay County, August 10, 1915, *St. John*, herb. Geol. Surv. Can.; rocky beach, Pointe au Maurier, Charnay, Saguenay County, July 16 and August 24, 1915, *St. John*, herb. Geol. Surv. Can.; strand, Vieille Romaine, Archipel Ouapitagone, Saguenay County, July 13, 1915, *St. John*, herb. Geol. Surv. Can.; salt water at mouth of Matane River, Matane County, August 6, 1904, *F. F. Forbes*. MAGDALEN ISLANDS: forming turf on sandy saline shore, Basin Island, July 20, 1912, *Fernald, Bartram, Long & St. John*, no. 6,914.

Var. **alaskana** (Scribn. & Merrill), n. comb. FIGS. 68–72. Usually larger throughout, occasionally stoloniferous; culms 0.5–4.5 dm. high: leaves up to 1.2 dm. long and 2 mm. broad; ligule about 2 mm. long: panicle 0.2–1.8 dm. long, the lower branches ascending or spreading, sometimes finally reflexed: spikelets 4.5–7 mm. long, 4–6-flowered: 1st glume 1.5–2 mm. long; 2d 2.5 mm. long: lemma 2.5–4 mm. long: anther 0.8–1 mm. long; grain 1.7–2.1 mm. long, readily separating from the palea; stolons flagelliform, resembling those of *P. phryganodes*, rarely developed at flowering season.— *P. alaskana* Scribn. & Merrill, Contr. U. S. Nat. Herb. xiii. 78 (1910). *P. maritima*, var. (?) *minor*, Watson in Gray Man. ed. 6, 668 (1890), as to Mt.

Desert plant, not as to description. *P. angustata* Rand & Redfield, Fl. Mt. Desert, 181 (1894) and later authors, as to plant, not as to name-bringing synonym, *Poa angustata* R. Br.— Coasts from western Newfoundland and the lower St. Lawrence to Connecticut; Alaska and British Columbia and "Oregon." NEWFOUNDLAND: conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, July 23, 1910, *Fernald & Wiegand*, no. 2,615; damp sandy shores, St. George's, August 13, 1910, *Fernald & Wiegand*, no. 2,614. QUEBEC: rocky shore, Ile du Havre, Mingan Islands, September 16, 1915, *St. John*, herb. Geol. Surv. Can.; brackish shores above the mouth of Dartmouth River, Gaspé County, August 26 & 27, 1904, *Collins, Fernald & Pease;* L'Anse à Griffon, Gaspé County, July 28, 1882, *J. Macoun*, herb. Geol. Surv. Can. no. 29,529; salt marsh, Cape Rosier, July 28, 1882, *J. Macoun*, herb. Geol. Surv. Can. no. 29,529; salt marshes, Ste. Anne des Monts, August 10, 1882, *J. Macoun*, herb. Geol. Surv. Can. no. 29,580; Little Métis, August 4, 1906, *J. Fowler;* various saline and sub-saline habitats, Bic, July, 1904, 1906, and 1907, *Fernald & Collins*, nos. 168, 359, 888, 889, 890; crevices of wet rocks by the St. Lawrence, Rivière du Loup, July 6, 1905, *Collins & Fernald*, no. 33; shore, Tadousac, August 7, 1892, *G. G. Kennedy;* marshes, vicinity of Cap à l'Aigle, August 14, 1905, *J. Macoun*, herb. Geol. Surv. Can. no. 69,223. MAGDALEN ISLANDS: sand-spit, Amherst Island, August 25, 1914, *St. John;* salt marsh by the Narrows, Alright Island, August 21, 1912, *Fernald, Long & St. John*, no. 6,917; gravelly beaches and brackish sands, Grindstone Island, July 18 and 22, 1912, *Fernald, Bartram, Long & St. John*, nos. 6,911, 6,912. PRINCE EDWARD ISLAND: damp brackish sand, Alberton, July 11, 1912, *Fernald & St. John*, nos. 6,916, 6,913 (dwarf form with abundant long stolons resembling those of *P. phryganodes*); salt marsh, Brackley Point, August 4, 1888, *J. Macoun*, herb. Geol. Surv. Can., no. 29,534; salt marsh, Tracadie, July 30, 1914, *Fernald & St. John*, no. 10,919; wet sand by Britain Pond, August 8, 1914, *Fernald & St. John*, no. 10,920; salt marsh, Mt. Stewart, July 30, 1912, *Fernald, Bartram, Long & St. John*, no. 6,915; salt marsh, Rocky Point, July 6, 1912, *Fernald & St. John*, no. 6,918; dryish border of salt marsh, Wood Island, July 29, 1914, *Fernald & St. John*, no. 10,918. NEW BRUNSWICK: sand bar, Miscou Island, August 26, 1913, *S. F. Blake*, no. 5,554; Bass River, Kent County, July 30, 1872, *J. Fowler*, herb. Geol. Surv. Can. no. 29,530; Kouchibouguac, August 17, 1869, *Fowler;* sand at outer edge of salt marsh, Shediac Cape, July 4, 1914, *F. T. Hubbard*, no. 695; beach sand, Shediac Island, August 5, 1914, *F. T. Hubbard*, no. 726. NOVA SCOTIA: North Sydney, July 14, 1883, *J. Macoun*, herb. Geol. Surv. Can., no. 29,528; sea-beaches, Baddeck, July 27, 1898, *J. Macoun*, herb. Geol. Surv. Can., no. 21,045; LeHave River, August 6 and 10, 1910, *J. Macoun*, herb. Geol. Surv. Can. nos. 81,493, 81,494; beach, Barrington Passage, June 20 and 24, 1910, *J. Macoun*, herb. Geol. Surv. Can., nos. 81,495, 81,498; sandy

shore, Loch Broom, July 21, 1914, *Fernald & St. John*, no. 10,917. MAINE: (common along the coast; about 70 numbers examined, of which the following are representative): strand, Pleasant Point, Perry, August 16, 1909, *Fernald*, no. 1,348; gravelly shore, Cutler, July 2, 1902, *Kennedy, Williams, Collins & Fernald;* salt marsh, Roque Bluffs, July 19, 1913, *C. H. Knowlton;* Gott's Island, July 20, 1899, *J. H. Redfield;* Mt. Desert Island, *Rand et al* (specimen from Somesville, June 13, 1883, forming part of *P. maritima*, var. (?) *minor* Watson); beach sand, Rockland, July 11, 1903, *Kate Furbish;* salt marsh, South Thomaston, August 15, 1913, *Bissell, Fernald & Chamberlain*, no. 8,799; sandy shore, Squirrel Island, August 2, 1892, *Fernald;* Horn Cove, Southport, August 4, 1894, *Fernald;* Peaks Island, June 29, 1909, *E. B. Chamberlain:* salt marsh, Great Chebeague Island, July 2, 1909, *Fernald*, no. 1,360; salt marsh, Cape Elizabeth, July 23, 1889, *Fernald;* sea-shore, Biddeford Pool, July 29, 1901, *G. G. Kennedy;* Kennebunkport, August 23, 1888, *G. G. Kennedy;* sandy shore, York, July 15, 1891, *Fernald.* NEW HAMPSHIRE: Rye, June 14, 1903, *E. F. Williams.* MASSACHUSETTS: sandy soil, shore of Menansha Creek, branch toward Gay Head, Martha's Vineyard, August 2, 1897, *S. Harris.* CONNECTICUT: shore of salt creek, Old Lyme, June 13, 1912, *C. H. Bissell, A. E. Blewitt*, no. 347. ALASKA: hillsides, St. Paul Island, August 11, 1892, *J. M. Macoun*, herb. Geol. Surv. Can. no. 29,579 (part of the original material of *P. alaskana*); Bella-bella Island, *A. Kellogg*, no. 147 in herb. Phil. Acad.; Idaho Inlet, Cross Sound, *T. Meehan* in herb. Phil. Acad. BRITISH COLUMBIA: Skidgate, Queen Charlotte Islands, July 18, 1910, *Spreadborough*, herb. Geol. Surv. Can. no. 87,622; Comox, Vancouver Island, June 27, 1893, *J. Macoun*, herb. Geol. Surv. Can. no. 243; vicinity of Ucleulet, Vancouver Island, May 16, and July 20, 1909, *J. Macoun*, herb. Geol. Surv. Can. nos. 82,335, 82,334; salt marsh, Nanaimo, Vancouver Island, June 14, 1887, *J. Macoun*, herb. Geol. Surv. Can. no. 29,538; Victoria, June 24, 1887, *J. Macoun;* salt marshes, Burrard Inlet, July 27, 1889, *J. Macoun*, herb. Geol. Surv. Can. no. 29,533. "OREGON": old specimen without further data.

Var. **longiglumis**, n. var. FIGS. 73–77. Major; culmis 3.5–7 dm. altis, ligulis 2–2.5 mm. longis; paniculis 1–2.5 dm. longis, ramis longis inferioribus patentibus vel reflexis; spiculis 6–12 mm. longis laxe 4–6-floris, rhachi flexuosa inter lemmata evidente; gluma inferiore 3–4 mm. longa obtusa vel acutiuscula, superiore 7–9 mm. longa 3–5-nervata oblongo-lanceolata acuta vel acuminata lemma proximum subaequante vel quam id longiore; lemmatibus 4.5–6 mm. longis 7-nervatis elliptico-ovatis; palea 3–4-mm. longa: antheris 0.7–1 mm. longis; caryopsibus 2.2–2.6 mm. longis.

Larger: culms 3.5–7 dm. high: ligule 2–2.5 mm. long: panicle 1–2.5 dm. long; the long lower branches spreading or reflexed: spikelets 6–12 mm. long, loosely 4–6-flowered; the flexuous rhachis visible

between the lemmas at anthesis: 1st glume 3–4 mm. long, obtuse or acutish; 2d 7–9 mm. long, 3–5-nerved, oblong-lanceolate, acute or acuminate, about equaling or longer than the adjacent lemma: lemma 4.5–6 mm. long, 7-nerved, elliptic-ovate; palea 3–4 mm. long: anthers 0.7–1 mm. long: grain 2.2–2.6 mm. long.— PRINCE EDWARD ISLAND: salt marsh, Bunbury, August 9, 1912, *Fernald, Long & St. John,* no. 6,920; border of salt marsh, Bunbury, August 28, 1912, *Fernald, Long & St. John,* no. 6,921 (TYPE in Gray Herb.).

In its extreme development (no. 6921) var. *longiglumis* seems sufficiently unlike var. *alaskana* or the tiny-flowered typical *P. paupercula* for specific separation, but numerous collections not only from Prince Edward Island but from the mainland show clear intergradation.

Var. *alaskana,* as it occurs on the Pacific coast, often has the lemmas firmer and the panicle-branches more spreading than in much of the eastern material, but both these characters reappear in many eastern colonies, leaving no character upon which the Atlantic and Pacific coast plants seem to be distinguished.

In publishing *P. maritima,* var. (?) *minor* Watson cited two specimens: "Shore of Mt. Desert Island (*E. L. Rand*); Labrador (*J. A. Allen*)." The Mt. Desert plant labeled in the Gray Herbarium by Watson is var. *alaskana,* while the Labrador plant of Allen (from Salmon Bay, Saguenay County, Quebec) is the little northern plant subsequently published by Holm as *Glyceria paupercula.* The description of *P. maritima* var. (?) *minor,* is clearly based upon the Allen plant, having "spikelets 2–4-flowered, the flowers 1″ long or less" so that the Allen plant stands as the type of var. *minor.*

Var. *alaskana* has been passing very generally in eastern America as *P. angustata,* based upon *Poa angustata* R. Br., but examination of a duplicate type of Brown's species, preserved in the Gray Herbarium, shows it to be a very distinct species, which is unknown to us from south of Arctic America. The plant is beautifully illustrated in Flora Danica, t. 3006, as *Glyceria angustata;* and it differs from all forms of the more southern *P. paupercula* in the erose-serrulate and coarsely toothed obtuse to subtruncate lemma pubescent on the nerves, and in the scabrous pedicels (FIGS. 59–62). Outside Greenland and Spitzbergen where the species has been frequently collected, it seems to be rare. We have examined American specimens from Goose Fjord, Ellesmereland, August 15, 1901, *H. G. Simmons,* no. 3,436 (herb. Geol. Surv. Can. no. 80,635); Beechy Island, Lancaster Sound,

August 24, 1908, *J. G. McMillan*, herb. Geol. Surv. Can. no. 77,271; and Melville Island, 1820, *Edwards* (original collection of *Poa angustata*).

Var. *alaskana* both in the East and the West has also been frequently identified with Presl's *Poa nutkaensis*, originally described from Vancouver Island. A fragment of the original Haenke material which was Presl's type, sent to Dr. Gray, shows, however that *Poa nutkaensis* has strongly scabrous branches and pedicels and that the glumes and lemmas are erose-ciliolate. The plant is more nearly related to *Puccinellia macra* than to any other species but differs in its firmer and less pubescent lemmas which are usually quite glabrous above the base. *Poa nutkaensis* seems to be a distinct species of the coast of Vancouver Island which should be called *Puccinellia nutkaensis*.[1]

EXPLANATION OF PLATES 114–117.

(Inflorescences $\times 1$; details $\times 10$).

PUCCINELLIA MARITIMA, from Rye, New Hampshire, *Robinson*, no. 683. 1. inflorescence; 2. glumes; 3. lemma and palea; 4. tip of lemma; 5. tip of palea; 6. anther.

P. PHRYGANODES, from Disco, Greenland, *Berggren*. 7. inflorescence; 8. glumes; 9. lemma and palea; 10. tip of palea; 11. anther.

P. FASCICULATA, from East Providence, Rhode Island, *Wiegand*, no. 931. 12. inflorescence; 13. glumes; 14. lemma and palea; 15. tip of palea; 16. anther.

P. RUPESTRIS, from New York City, New York, *Addison Brown*. 17. inflorescence; 18. glumes; 19. lemma and palea; 20. tip of lemma; 21. tip of palea; 22. anther.

P. DISTANS, from Boston, Massachusetts, *C. E. Faxon*. 23. inflorescence; 24. glumes; 25. lemma and palea; 26. tip of palea; 27. anther.

P. COARCTATA, from Dildo Run, Newfoundland, *Fernald & Wiegand*, no. 4,655 (TYPE). 28. inflorescence; 29. glumes; 30. lemma and palea; 31. tip of palea; 32. anther.

[1] PUCCINELLIA **nutkaensis** (Presl), n. comb. FIGS. 49–53. *Poa nutkaensis* Presl, Rel. Haenk. i. 272 (1830). *P. nootkaensis* Scribn. Mo. Bot. Gard. Rep. x. 51, t. 51, fig. 1 (1899), excluding synonyms.— Coast of BRITISH COLUMBIA, chiefly on Vancouver Island: Nootka Sound, V. I., *Haenke* (fragment of TYPE in Gray Herb.); San Juan River, V. I., August 12, 1907, *Rosendahl*, no. 2062; marshes, Victoria, V. I., June 24, 1887, *J. Macoun*, herb. Geol. Surv. Can. no. 29,531; crevices of rocks, Oak Bay, V. I., June 18, 1887, *J. Macoun*, herb. Geol. Surv. Can. no. 29,526; salt marshes, Tuxedo Island, Gulf of Georgia, June 26, 1885, *Dawson*, herb. Geol. Surv. Can. no. 29,536; salt marshes, Nanaimo, V. I., July 12, 1893, *J. Macoun*, herb. Geol. Surv. Can., no. 247; vicinity of Comox, V. I., July 5, 1893, *J. Macoun*, herb. Geol. Surv. Can. no. 245; Kitsilano, near Vancouver, August 21, 1911, *M. O. Malte*.

P. LAURENTIANA, from Tracadigash Point, Carleton, Quebec, *Collins & Fernald* (TYPE). 33. inflorescence; 34. glumes; 35. lemma and palea; 36. tip of lemma; 37. tip of palea; 38. anther.

P. MACRA, from Bonaventure Island, Quebec, *Fernald & Collins*, no. 891 (TYPE). 39. upper $\frac{2}{3}$ of inflorescence; 40. glumes; 41. lemma and palea; 42. tip of palea; 43. anther.

P. AIROIDES, from Doyle's, Colorado, *C. F. Baker*, no. 637. 44. inflorescence; 45. glumes; 46. lemma and palea; 47. tip of palea; 48. anther.

P. NUTKAENSIS, from San Juan River, Vancouver Island, *Rosendahl*, no. 2,062. 49. inflorescence; 50. glumes; 51. lemma and palea; 52. tip of palea; 53. anther.

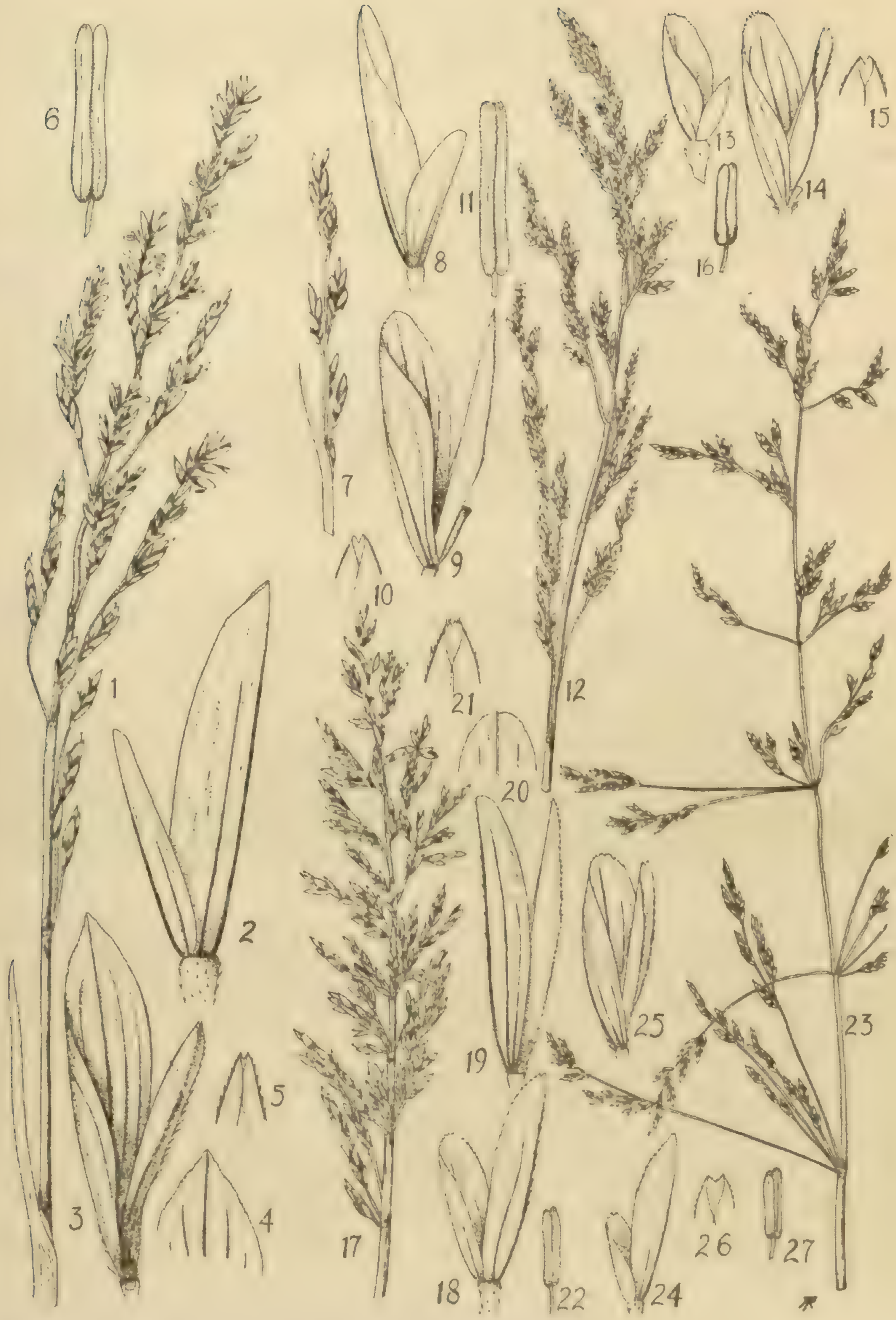
P. LUCIDA, from Cacouna, Quebec, *Fernald* (TYPE). 54. middle half of inflorescence; 55. glumes; 56. lemma and palea; 57. tip of palea; 58. anther.

P. ANGUSTATA, from Disco, Greenland, *T. M. Fries*. 59. inflorescence; 60. glumes; 61. lemma and palea; 62. anther.

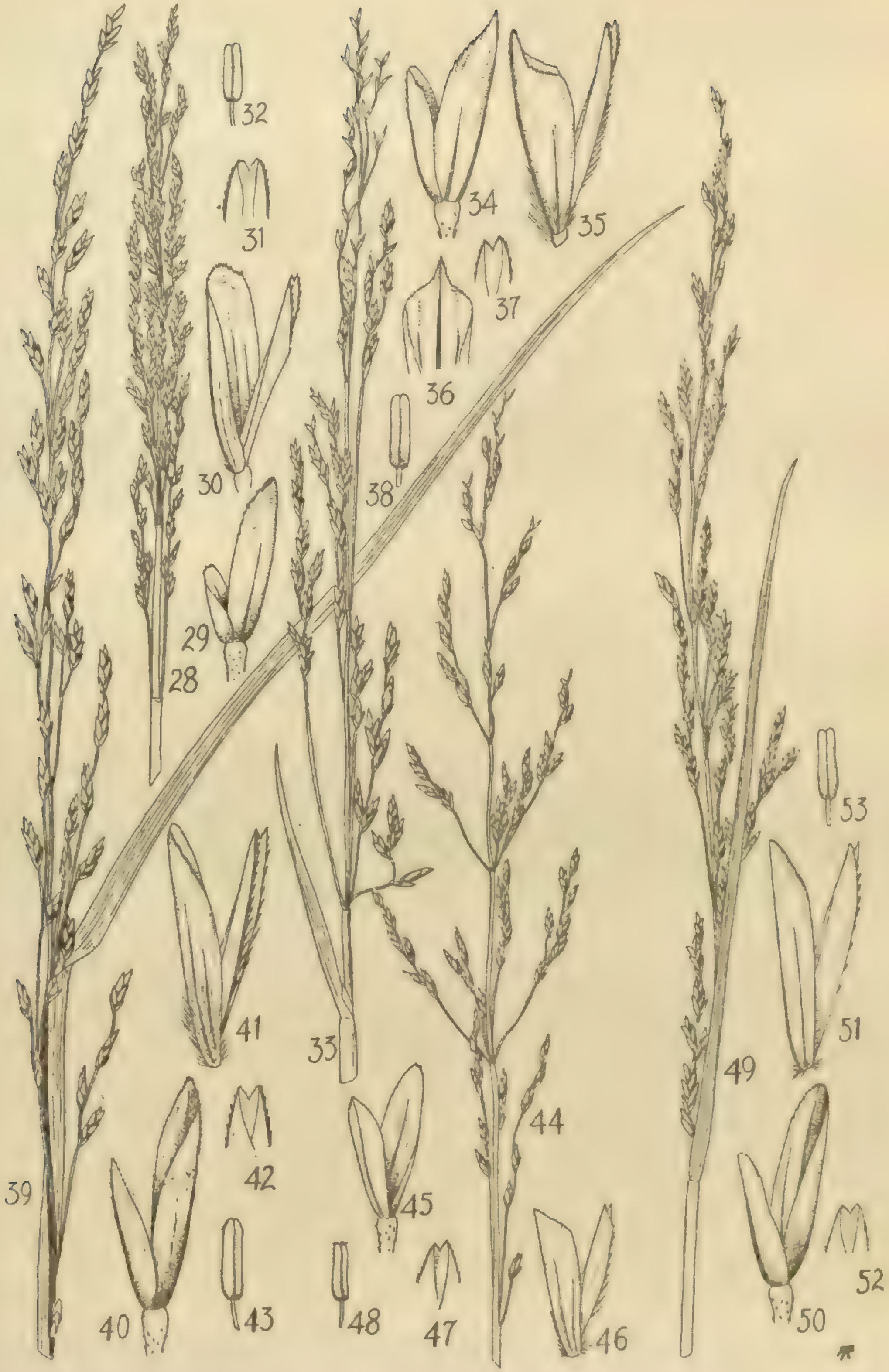
P. PAUPERCULA, from Salmon Bay, Saguenay County, Quebec, *J. A. Allen* (type of *P. maritima*, var. (?) *minor*). 63. inflorescence; 64. glumes; 65. lemma and palea; 66. tip of palea; 67. anther.

P. PAUPERCULA var. ALASKANA, from Burrard Inlet, British Columbia, *John Macoun*. 68. young inflorescence; 68a. mature inflorescence; 69. glumes; 70. lemma and palea; 71. tip of palea; 72. anther.

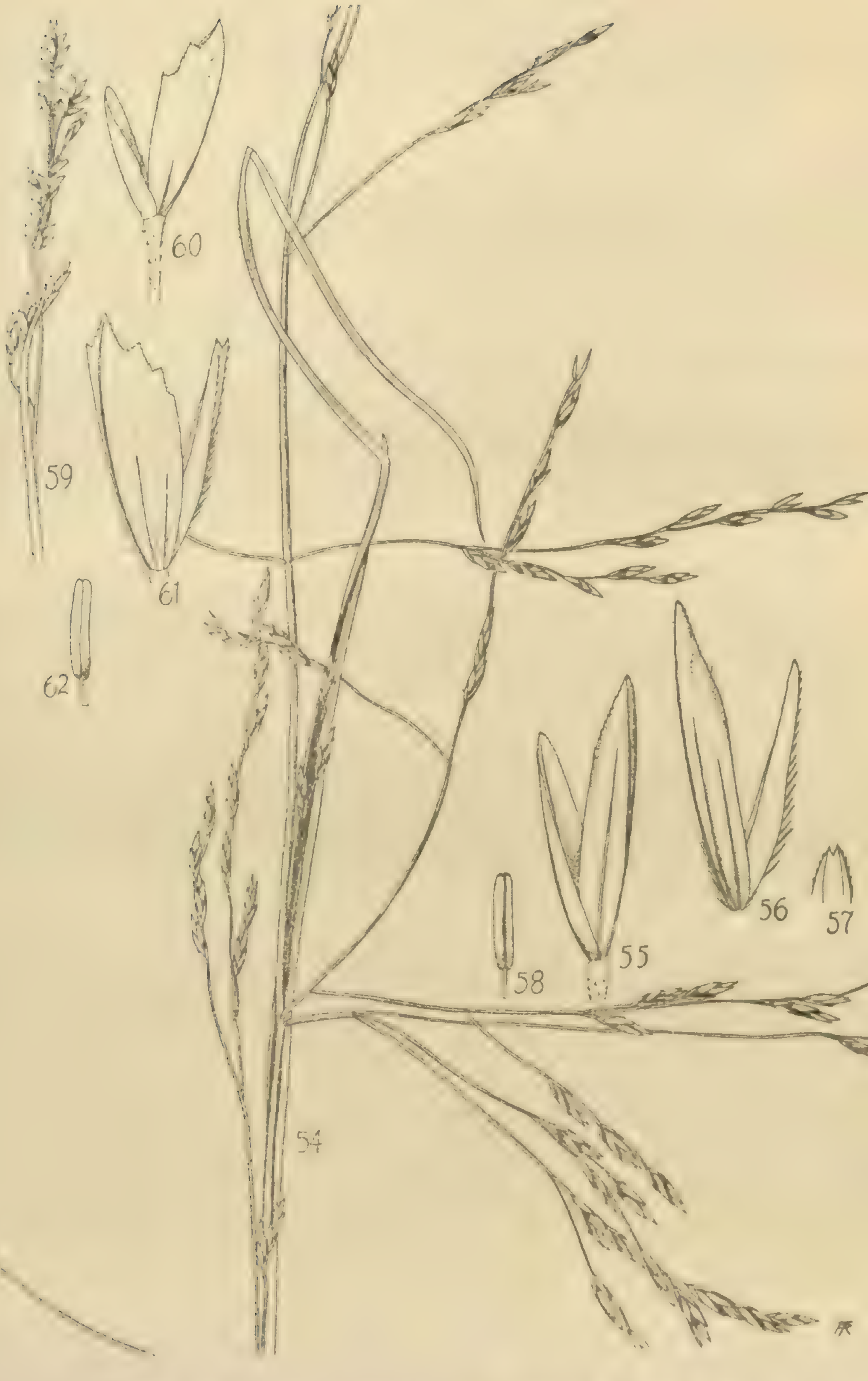
P. PAUPERCULA, var. LONGIGLUMIS, from Bunbury, Prince Edward Island, *Fernald, Long & St. John*, no. 6,920. 73. small inflorescence; 74. glumes; 75. lemma and palea; 76. tip of palea; 77. anther.



Figs. 1–6, *Puccinellia maritima;* 7–11, *P. phryganodes;* 12–16, *P. fasciculata;* 17–22, *P. rupestris;* 23–27, *P. distans.*



Figs. 28–32, *Puccinellia coarctata;* 33–38, *P. laurentiana;* 39–43, *P. macra;* 44–48, *P. airoides;* 49–53, *P. nutkaensis.*



Figs. 54–58, *Puccinellia lucida;* 59–62, *P. angustata.*

Figs. 63–67, *Puccinellia paupercula;* 68–72, *P. paupercula*, var. *alaskana;* 73–77, *P. paupercula*, var *longiglumis.*

CONTRIBUTIONS FROM THE GRAY HERBARIUM
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A REVISION OF THE GENUS POLYGALA IN MEXICO, CENTRAL AMERICA, AND THE WEST INDIES

BY S. F. BLAKE

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A REVISION OF THE GENUS POLYGALA IN MEXICO, CENTRAL AMERICA, AND THE WEST INDIES.

By S. F. Blake.

Of the some 137 species of *Polygala* now definitely known from Mexico, Central America, and the West Indies (including the Lesser Antilles and Trinidad), only three were known to Linnaeus from this area. A fourth plant, described by Linnaeus as *P. diversifolia*, has always been considered a member of the section or genus *Badiera*, although its status has never been definitely established, but examination of the type specimen in the Hortus Cliffortianus authorizes its reference to the synonymy of *Securidaca volubilis* L.

The first really noteworthy contribution to the knowledge of Middle American Polygalas was made in the Nova Genera of Humboldt, Bonpland, & Kunth, where six new species were described from Central America and Mexico, and six others, later to be recorded from this area, from South America. Here for the first time satisfactory descriptions were given of the species of this difficult genus. Nearly all the previously described species had been so inadequately defined that their recognition from description alone is well-nigh impossible, and the same is true of the new species contained in the first volume of the Prodromus (1824), and to a less extent of those published by Presl, Chamisso, and Schlechtendal from 1830 to 1840. In 1852 Gray published critical notes and descriptions of several new species, based chiefly on Wright's Texan-New Mexican collection. Five years later Seemann, recording the species of the voyage of the Herald, fell into an unfortunate excess of over-reduction of specific names, synonymizing with Mexican species unrelated ones of South America, and in one case lumping under one trivial specific names representing at least nine species of two quite distinct subgenera. Otto Kuntze in 1891, dealing with much the same groups of species, fell into equally absurd errors.[1]

In 1879 A. W. Bennett published in the Journal of Botany an important series of papers dealing with the Polygalas of North and

[1] See Kuntze, Rev. Gen. i. 48–49 (1891); Chod. Bull. Herb. Boiss. iii. 128 (1895).

South America. Many new species were described, the range of many others extended, and for the first time a certain amount of order was brought into the chaos which had hitherto reigned in the classification of the Middle American species. In the same year Hemsley recorded in the Biologia Centrali-Americana 39 species, besides one unidentified species, from Mexico and Central America. This list is based chiefly on Bennett's work, but many of the identifications there recorded are erroneous. Between this date and 1891 several new species of considerable interest were published by Watson, chiefly from Palmer's and Pringle's collections.

A new epoch in the study of the genus *Polygala* was initiated by the appearance of Chodat's monograph in 1893. Here the species of the world, some 405 in number (of which some 57 were recorded from Mexico, Central America, and the West Indies), were divided into ten well-marked sections, and the great value of the characters to be derived from the persistence or deciduousness of sepals and wings, the nature of aril, capsule, and style, and the clothing of the seed, received due recognition and illustration. Unfortunately this work, on which all future taxonomic study of the genus must be based, is marred by many typographical and other inaccuracies. One finds two new species described under the same name, and even two consecutive valid species maintained with the same trivial; unfortunate errors of geography, of author-citation, and of nomenclature; omission of mention of species described in easily accessible works; and keys so loosely drawn up as to be frequently misleading. All these faults, however, cannot obscure the real worth of Chodat's monograph, which in its main lines is thoroughly sound, and from its wealth of illustration must always remain an indispensible work of reference.

The genus *Polygala*, in the wide sense in which it is taken by Chodat and by the writer, includes forms of great diversity in habit and considerable difference in structural characters, but the ten sections into which it is divided by Chodat, although well defined, are so regularly graduated that the separation of any one of the few (*Phlebotaenia*, *Badiera*, *Acanthocladus*, *Chamaebuxus*) sometimes recognized as distinct would involve in consistency the recognition of all. Its two or (if the species of *Chamaebuxus* with beaked keel be distinguished) three primary divisions based on the structure of the keel possess greatest claim to generic rank, although no one has

yet proposed to split the genus on this feature alone. Of the sections recognized by Chodat, here taken as subgenera in view of their strong characters and for convenience of subordination of their minor divisions, six[1] occur in the region under consideration. The first four — *Phlebotaenia*, *Badiera*, *Hebecarpa*, *Hebeclada* — are chracterized by a crestless, beakless keel; the fifth — *Chamaebuxus* — by a beaked keel; and the sixth — *Orthopolygala* — by a fimbriate-crested keel. Their characters can best be considered separately.

1. *Phlebotaenia.* Two species, confined to Cuba and Porto Rico, shrubs or even trees up to fifty feet high (according to Wright's label), with large showy purple flowers in axillary racemes and large very coriaceous very densely and dichotomously reticulate-veined leaves. The sepals are free and caducous, the wings caducous, and the keel beakless and crestless; the capsule 1- or 2-seeded, large, broadly winged on one side. The type species was originally published as a distinct genus by Grisebach under the above name, but its characters, when the whole range of variation in the group is taken into consideration, do not support this view, and one of the technical characters on which emphasis was laid by Grisebach — the introrse pores of the anthers — is by no means a peculiarity of this group. Careful dissection of species of *Hebecarpa* and *Hebeclada* shows exactly the same introrse-subapical opening that is found in *Phlebotaenia.* In the Genera Plantarum (i. 136) of Bentham and Hooker, *Phlebotaenia* is characterized as having " petala lateralia e carina libera et basi dissita, superiora minora minuta vel O." In these features, however, *Phlebotaenia* agrees with other Polygalas. The upper petals (" petala lateralia " of B. & H.) are not joined to the keel, it is true, but are firmly adnate to the staminal tube; the lateral (" petala superiora " of B. & H.) are present and larger than in most Polygalas, although still much smaller than the upper. The removal of *Phlebotaenia* from *Polygala* to such a degree in the Genera seems to be based on a misconception.

2. *Badiera.* I have recognized eleven species, all West Indian, several of which have not been examined. They form a habitally very distinct group of shrubs or small trees with oblong to elliptic coriaceous slightly veined leaves and very short axillary racemes of

[1] Including *Badiera*, treated by Chodat as a subsection of his section *Hebecarpa.*

small yellowish or greenish flowers. The sepals and only slightly larger wings are subherbaceous and persistent (not deciduous as described by Chodat), the keel beakless and crestless, and the capsule (sometimes one-celled by abortion) is wingless with thick subcoriaceous walls and only tardily dehiscent. The typical species, *P. Penaea* L., was with a few other species made into a genus by De Candolle, which is retained by Bentham & Hooker, Urban, and by Britton, who has twice revised the group. In the lack of any really distinctive technical characters, however, it seems much better retained in *Polygala*. By Chodat it was sunk to subsectional rank under his section *Hebecarpa*, but it certainly merits equal recognition with his other primary divisions of *Polygala*.

3. *Hebecarpa*. Of this very difficult group, which also occurs in the southwestern United States and South America, some sixty speces are here recognized. They are always perennial herbs or undershrubs, with herbaceous stems and usually fruticulose base, the flowers usually purple and medium-sized for the genus. The wings, except in one species and to a less degree in one or two others, are deciduous like the (very rarely persistent) sepals; the keel is neither beaked nor crested; and the fruit is usually narrowly margined. The variations in aril-form are here extreme and much use has been made of them in specific discrimination. Seeds of all species accessible to me at the present time have been figured, and it is hoped that at a later date the series can be made complete, since a correct idea of the seed-appendages can be given in no other way. Although in a number of cases I have described the flowers as apparently ochroleucous in dried material, it is not improbable that they are always of some shade of purple.

The three sections into which the subgenus is here divided are based chiefly on the persistence or deciduousness of the sepals and wings, as indicated in the key on p. 18. The two larger subsections I have adopted under the main section (*Euhebecarpa*) are admittedly unsatisfactory as at present constituted, being founded chiefly on leaf-size. Had mature seeds of every species been available, a more natural classification could undoubtedly have been made. In the typical species of subsect. *Hebantha* the corneous umbo of the aril is minute or almost wanting and the scarious border broad and variously disposed; in subsect. *Microthrix* the umbo is large and the scarious margin usually small or medium.

Some species here included in *Hebantha* on foliage-characters have however the aril much as in *Microthrix*, and in some cases it may be necessary to search in the keys of both subsections to determine a plant whose position is not clear. A satisfactory grouping of the species in this subsection (*Euhebecarpa*) must await the discovery of mature seeds in all the species.

Chodat (Monog. i. 50–51 (1891)) has fallen into error in ascribing extra-axillary racemes to this subgenus. The apparently extra-axillary racemes commonly seen in many species are in reality terminal, their position being due to the excessive growth of a normal axillary branch from at or near the base of the originally terminal peduncle, a process which may be several times repeated on the same stem. Only in *Hebeclada* and *Chamaebuxus* have I found apparently extra-axillary racemes that were not clearly susceptible of explanation in this way.

4. *Hebeclada*. A strictly American and very distinct group, represented in the region under consideration by fifteen species, herbs or shrubs, sometimes annuals, with rather loose racemes of purple flowers. The lower sepals are united nearly or quite to apex, and with the upper sepal and the often strongly inequilateral petaloid wings are very persistent. The aril in this group is large or medium, corneous, lobeless or with three very inconspicuous lobes, and without scarious margin. Although connate lower sepals do not occur in any other American Polygalas, there are a number of African and Madagascarene species of *Orthopolygala* (subsect. X. Chodat, in part) where they are likewise found.

5. *Chamaebuxus*. This subgenus, as sectionally defined by Chodat, was distinguished by its more or less crested keel, peculiar stigmata, deciduous sepals and wings, and especially by the possession of an annular or gland-like disc at the base of the ovary. The Mexican species, with a few others from the southwestern United States, form a most distinct section in which the crest of the keel is an entire conic or cylindric closed beak. In a single species, *P. desertorum* Brandegee, the sepals and wings are long-persistent as in *Orthopolygala*, but the rostrate keel and other characters place the species in *Chamaebuxus*.

6. *Orthopolygala*. This large subgenus, including about three-quarters of the known Polygalas of the world, is less abundantly represented in Mexico and the West Indies, where it includes

slightly less than a third of the known species. They are herbs, annual or perennial, in one section suffrutescent at base, with persistent wings and sepals, the keel bearing an infra-apical variously lobed crest. In two African species (*P. Petitiana* A. Rich. and *P. nilotica* Chod.) of this subgenus there is, according to Chodat, no crest whatever. In *P. paucifolia* Willd., of our eastern states, a member of the subgenus *Chamaebuxus*, there is a strongly lobed fimbriate crista, and in various Old World species of *Chamaebuxus* there is a crest of varying complexity.

The Middle American species of *Orthopolygala* divide naturally into two sections. In one, confined to Central America, Mexico, and the adjacent United States in North America (but occurring also in South America), the upper cell of the capsule is dehiscent between the narrow wings, while the slightly shorter lower cell is usually indehiscent and its seed generally unappendaged. In the other section, including the bulk of the species, the capsule is wingless, equally 2-celled, and both cells are dehiscent. The species of the latter section can be divided into very satisfactory groups on characters of seed-pubescence and aril. In this as in the other subgenera emphasis has been laid in the present revision on seed- rather than on stigma-characters as offering more easily observable and definable and quite as trustworthy characters for the discrimination of species.

The present revision was begun and partially completed during the summer of 1915 at the British Museum and at Kew Herbarium, and my grateful thanks are due to Dr. A. B. Rendle and Dr. Otto Stapf for the opportunity to study the collections under their charge, including many types of the utmost importance. Through the kindness of Dr. Stapf fragments of several types were transmitted to the Gray Herbarium, where the revision has been brought to completion, and where the examination of an abundance of Mexican material has led to corrections or fundamental alterations in my conception of several species. While at the British Museum I was, through the kindness of the Honorable William Fawcett, enabled also to study the collection of *Polygala* in the herbarium of the Jamaica Botanic Garden. Grateful acknowledgments are also due Dr. B. L. Robinson for his interest and assistance in the publication of this revision.

In nomenclature the International Code has been strictly followed. The herbaria in which the specimens cited are located have

been indicated by letters (B = British Museum of Natural History; G = Gray Herbarium; J = Herbarium of the Botanic Department of Jamaica; K = Kew Herbarium). A few species of the southwestern United States, included for comparison with their near relatives of Mexico, and of probable occurrence south of the border, have been distinguished by decimals in the enumeration of species (27.1, etc.). Throughout the revision the term sepals has reference only to the three outer sepals, the two inner being always referred to as wings or alae. The seed-measurements always include the aril (except in one or two specified cases) but (except in the series *Trichospermae* of *Orthopolygala*) do not include the pubescence of the seed. The measurements of capsule include the stipe, except where otherwise specified.

In his last paper on the genus (1914) Chodat has treated the name *Polygala* as of neuter gender. As a botanical term the word has always been feminine, and I can see no advantage in such a change made at this late day on principles of purism.

POLYGALA L.

Herbs, shrubs, or trees, with alternate or rarely verticillate leaves and terminal or axillary rarely extra-axillary racemes of usually purplish flowers. Sepals (i.e. the three outer) herbaceous or the lower two very rarely petaloid, free or the two lower connate, deciduous or persistent. Wings (two inner sepals) petaloid or rarely subherbaceous, deciduous or persistent. Petals normally three, united at base; the lower carinate, boat-shaped, sometimes 3-lobed, unappendaged or with an infra-apical beak or fimbriate crest; the two upper united to staminal tube or to keel at least at base; the two lateral petals rarely present, always very small. Stamens 8 or rarely 6, united nearly to apex into a tube split on the upper side, adnate to keel and upper petals at base; anthers opening by apical or introrse-apical pores. Style often elongate, the two stigmata very various, often tufted. Capsule equally or unequally 2-celled, one cell sometimes more or less completely abortive, winged, margined, or marginless, usually membranaceous-herbaceous or herbaceous, rarely subcoriaceous-fleshy; the cells dehiscent or rarely the lower indehiscent. Seeds ellipsoid or obovoid to fusiform or conic, usually pubescent. Aril very varied (very rarely almost

absent), scarious, corneous, cellular, or coriaceous-fleshy, entire or variously lobed, often pubescent.—*Polygala* L. Sp. ii. 701 (1753); Gen. V. ed. 315. no. 761 (1754); Willd. Sp. iii. pt. 2. 871 (1803); HBK. Nov. Gen. v. 392–409. t. 506–512 (1821); DC. Prod. i. 321–334 (1824), incl. *Badiera*; Presl, Rel. Haenk. ii. 100 (1835–36); Schlecht. & Cham. Linn. v. 230 (1830); Schlecht. Linn. xiv. 159–160 (1840); Benth. Pl. Hartw. 58 (1840); Gray, Pl. Lindh. ii. 150 (1850); Pl. Wright. i. 38 (1852), ii. 30 (1853); Turcz. Bull. Soc. Nat. Mosc. xxvii. no. 2. 349–351 (1854); Seemann, Bot. Herald 269–270 (1857); Griseb. Fl. Br. W. I. 27–29 (1859); Cat. Pl. Cub. 12–14 (1866); A. W. Benn. Journ. Bot. xvii. 137–143, 168–173, 201–207 (1879); Hemsl. Biol. Centr.-Am. Bot. i. 58–62 (1879); Wats. Proc. Am. Acad. xvii. 324–326 (1882), xxi. 416–417 (1886), xxii. 398 (1887); Wheelock, Mem. Torr. Club ii. 109–152 (1890); Chod. Arch. Sci. Phys. Nat. Genève xxv. 695–714 (1891); Monog. Polygalacearum i. (Mem. Soc. Phys. Hist. Nat. Genève vol. suppl. 1890. no. 7) 1–143. t.1–12 (1891), ii. (l.c. xxxi. pt. 2. no. 2) i–xii, 1–500. t. 13–35 (1893); Bull. Herb. Boiss. i. 354 (1893), iii. 121 (1895), iv. 898 (1896); in Engl. & Prantl, Nat. Pfl. iii. pt. 4. 330–337. f. 176–181 (1896); Rob. in Gray, Syn. Fl. i. pt. 1. 449–460 (1896); Rose, Contr. U. S. Nat. Herb. x. 122–123. t. 37–39 (1906); Britton, Bull. Torr. Club xxxvii. 360–363 (1910), xlii. 494–496 (1915) (*Badiera*); Chod. Bot. Jahrb. lii. Beibl. 115. 70–85 (1914).

Key to the Subgenera of Polygala

a. Keel without crest or beak, *b.*
  b. Leaves very densely and dichotomously reticulate-veined; capsule broadly winged on one side . . . . . I. Phlebotaenia.
  b. Leaves and capsule otherwise, *c.*
    c. Sepals all free, *d.*
      d. Wings very small, about ⅓ longer than sepals; capsule subcoriaceous, tardily dehiscent . . . . . II. Badiera, p. 10.
      d. Wings much larger than sepals; capsule not subcoriaceous . . . . . III. Hebecarpa, p. 17.
    c. Two lower sepals connate; wings and sepals persistent . . . . . IV. Hebeclada, p. 59.
a. Keel with a cylindric or conic entire beak . . . . . V. Chamaebuxus, p. 69.
a. Keel with a 2–many-lobed crest . . . . . VI. Orthopolygala, p. 78.

Subgenus I. **PHLEBOTAENIA** (Griseb.), comb. nov.

Sepals free, caducous, herbaceous, oval-oblong, obtuse, the upper longer. Wings oval, obtuse, caducous, petaloid, nearly equalling the keel. Keel blunt, without crest or beak. Upper petals ob-

liquely oblong, slightly shorter than the wings, united at base to the keel. Lateral petals present, small, united to staminal tube. Stamens 8 (7–9 fide Chodat), monadelphous, the tube united toward base to the keel; anthers much shorter than the free (glabrous) portion of the filaments. Stigmatic lobes remote, not tufted. Capsule large, glabrous, with a very broad membranous wing on one side, narrowly winged on the other; one or two seeds maturing. Seeds obovoid, densely pilosulous-velutinous. Aril rather large, coriaceous-fleshy, glabrous. Shrubs or trees, glabrous or nearly so except on petioles and raceme-axes, with alternate very coriaceous closely dichotomously reticulate-veined cuneate to elliptic leaves, and large flowers in 3–13-flowered axillary racemes. *Phlebotaenia* Griseb. Pl. Wright. Cub. i. 156 (1860); Britton, Torreya vii. 38 (1907); Urb. Sym. Antill. v. 382 (1908). *Polygala* L. sect. *Phlebotaenia* Chod. Arch. Sci. Phys. Nat. Genève xxv. 698 (1891); sect. *Phlaebotaenia* (Griseb.) Chod. Monog. ii. 4 (1893).

Leaves 2.4–5.5 cm. long, 10–18 mm. wide . . . . . 1. *P. cuneata.*
Leaves 8–12.5 cm. long, 3.2–6.9 cm. wide . . . . . 2. *P. Cowellii.*

1. P. **cuneata** (Griseb.), comb. nov. Tree 15 m. high, 0.3–0.6 m. thick (fide Wright), glabrous except the densely puberulous raceme-axes, more or less glutinous. Leaves cuneate to cuneate-oblong or -obovate, narrowed to the base, rounded, truncate, or retuse at apex, glabrous; petioles puberulous above, 3–6 mm. long. Racemes mostly shorter than the leaves, 3–10-flowered; pedicels glabrous, shorter than the flowers. Flowers 1–1.4 cm. long, purplish. Sepals and wings ciliolate. Upper petals and wings puberulous toward base. Capsule 1.3–2.8 cm. long, 1.1–1.6 cm. wide. Seed about 7 mm. long. — *Phlebotaenia cuneata* Griseb.! l.c. 157 (1860). *Polygala Phlebotaenia* Chod.! l.c. ii. 4. t. 13. f. 1–4 (1893).

Forma **typica.** Folia cuneata vel cuneato-oblonga apice rotundata vel retusa 2.8–5.5 cm. longa 1–1.8 cm. lata. — Cuba: Mount Friendship, near Santa Catalina de Guantanamo, 25 July 1856, *Wright* 113 (type coll: BGK); dry rocky ground near Havana, 13 April 1905, *Curtiss* 717 (BGK); woodlands, Ensenada de Mora, Oriente, March 1912, *Britton, Cowell, & Shafer* 12981 (K); coastal woods, Ensenada de Mora, March 1912, *Britton, Cowell, & Shafer* 13063 (K).

Forma **obovata** (Griseb.), comb. nov. Folia cuneato-obovata apice rotundata vel retusa 2.4–2.7 cm. longa 1.2–1.8 cm. lata. —

Phlebotaenia cuneata Griseb. var. *obovata* Griseb.! Cat. Pl. Cub. 14 (1866). *Polygala Phlebotaenia* Chod. var. *obovata* (Griseb.) Chod.! l.c. ii. 5 (1893). — CUBA: Loma di Rangel, near San Cristobal, 17 June (1860–64), *Wright* 1917 (TYPE COLL.: BGK). — T. 1. FIG. 1 (aril removed).

2. P. **Cowellii** (Britton), comb. nov. Tree up to 10 m. high, 1.5 dm. thick, the branches sparsely appressed-pubescent, at length glabrate. Leaves oblong to elliptic, cuneate to rounded at each end, or abruptly pointed with obtuse apex, glabrous or with a few hairs along midvein both sides; petioles puberulous above, 5–7 mm. long. Racemes 2.5 cm. long, simple or with a basal branch, subsessile on leafless branches, 6–13-flowered, their axes like the pedicels (4–9 mm. long) densely spreading-puberulous. Flowers 1.4–1.5 cm. long, purple. Sepals broadly elliptic, rounded, purplish-green, ciliate, otherwise glabrous except at base, the upper 4 mm. long, the lower 2.5 mm. long. Wings elliptic-obovate, obtuse, short-clawed, 14.5 mm. long, 9 mm. wide. Keel obliquely truncate at apex, with two rotund lateral lobes, 14 mm. long. Upper petals oblong, united to staminal tube only toward base, 13.5 mm. long. Ovary with one fruitful thick-walled cell and one sterile thin-walled winged cell. Fruit unknown. — *Phlebotaenia Cowellii* Britton, Torreya vii. 38 (1907). *Phlebotaenia portoricensis* Urb.! Sym. Antill. v. 382 (1908). — PORTO RICO: woods, Mt. Calabara, near Coamo, 30 Dec. 1885, *Sintenis* 3288 (K); near Cajuco, 9 Mar. 1887, *Sintenis* 6417 (K); rocky bank near Coamo Springs, 16 Mar. 1913, *Britton, Britton, & Marble* 2228 (G); without definite locality, *R. H. Heatslet* (K).

Vernacular name " satinwood," according to Heatslet.

Subgenus II. **BADIERA** (DC.), comb. nov.

Sepals free, persistent, subherbaceous, obliquely oval, round-tipped, subequal, ciliolate. Wings obliquely ovate, obtuse, ciliolate, similar in texture to the sepals and only about one-third longer, persistent. Upper petals obliquely oblong-obovate, obtuse, arched, about twice as long as wings and slightly shorter than keel, adnate to staminal tube, free from the keel. Keel blunt, short, without crest or beak, narrowed at base into a claw, united at extreme base to staminal tube. Stamens 8, the filaments glabrous, united nearly

to apex. Ovary more or less pubescent; style about two to three times as long as ovary; stigmatic lobes approximate, not tufted. Capsule coriaceous-fleshy, equally 2-celled (one cell often aborted), wingless, barely margined, distinctly stiped, the cells at length dehiscent. Seeds sparsely pubescent. Aril large, somewhat helmet-shaped, equitant, appressed, coriaceous-fleshy, glabrous, somewhat lobed. — Evergreen shrubs or trees with alternate oblong to oval or ovate slightly veined coriaceous leaves exceeding the dense very short umbelliform or spiciform axillary racemes of small flowers. — *Badiera* DC. Prod. i. 334–335 (1824); Deless. Ic. Select. iii. 13. t. 21 (1837); Britton, Bull. Torr. Club xxxvii. 360–363 (1910); Britton, l. c. xlii. 494–497 (1915). *Polygala* L. sect. *Hebecarpa* Chod. group I. Chod. l. c. ii. 9 (1893).

a. Leaves more or less harshly papillose-scabrous above, *b.*
  b. Leaves narrowly obovate, very scabrous above; fruit densely spreading-hispidulous or -pilosulous .....3. *P. Penaea.*
  b. Leaves broadly obovate to obovate-oblanceolate, slightly scabrous above; fruit at maturity pubescent chiefly on the margin .....4. *P. guantanamana.*
a. Leaves smooth above (merely strigillose or glabrate), *c.*
  c. Peduncle longer (3.1–6 mm.) than the pedicels (1.5–2 mm.) .....13. *P. Fuertesii.*
  c. Peduncle shorter than the pedicels, *d.*
    d. Fruit trigonous or subquadrate in outline, about as broad as long, *e.*
      e. Leaves 3 (rarely 5) cm. long or less, usually emarginate at the rounded apex (Cuba, Porto Rico, Bahamas), *f.*
        f. Fruit 7–8 mm. long, 7–8 mm. wide; stipe 1–1.5 mm. long, *g.*
          g. Leaves oblong, elliptic-oblong, or obovate-oblong .....5. *P. oblongata.*
          g. Leaves ovate or ovate-elliptic .....6. *P. punctifera.*
        f. Fruit 5 mm. long, 6 mm. wide; stipe 0.6 mm. long .....7. *P. portoricensis.*
      e. Leaves 3.5–8 cm. long, usually short-pointed (Jamaica) .....8. *P. jamaicensis.*
    d. Fruit transversely oblong, distinctly wider than long, *h.*
      h. Fruit lobed about one-fifth its length, the lobes divergent-spreading, *i.*
        i. Leaves ovate to obovate, abruptly short-pointed; fruiting pedicels 2–2.8 mm. long; stipe 2–2.5 mm. long .....9. *P. stipitata.*
        i. Leaves oval, rounded or emarginulate at apex; fruiting pedicels 1.5–2 mm. long; stipe 1 mm. long .....10. *P. montana.*
      h. Fruit lobed about one-third its length, the lobes erect-ascending, *j.*
        j. Fruit 7–7.5 mm. long, 9.5–10 mm. wide .....11. *P. propinqua.*
        j. Fruit 5 mm. long, 7–8 mm. wide. .....12. *P. dimorphophylla.*

3. P. Penaea L. Stem and branches densely hispidulous-pilosulous with stiff ascending hairs. Leaves narrowly obovate, broadly rounded or rarely obtuse at apex, apiculate, acutely cuneate at base, revolute, rough especially above with short persistent tuberculate-based incurved hairs, 1.8–3.2 cm. long, 7–15 mm. wide. Raceme-axis 2.8 mm. long or less, the pedicels 1.5–2 mm. long in fruit. Flowers 2.8 mm. long, greenish-yellow. Sepals deltoid-ovate, obtuse, ciliolate, sparsely puberulous on back, 0.8–1 mm. long and wide. Wings similar, 1.4 mm. long, 1.1 mm. wide. Keel ciliate more than one-half its length, 2.8 mm. long. Upper petals somewhat arched, 2.7 mm. long. Filaments united nearly to apex, the tube ciliate on margin. Fruit 4 mm. long, 9 mm. wide, transversely oblong, shortly hispidulous-pilosulous. — L. Sp. ii. 703 (1753). *P. domingensis* Jacq. Stirp. Am. ed. min. 252 (1788); Chod. l. c. ii. 9. t. 13. f. 9–11 (1893). *Badiera Penaea* (L.) DC. Prod. i. 335 (1824); Britton, Bull. Torr. Club xxxvii. 361 (1910); l. c. xlii. 494 (1915). *Badiera domingensis* (Jacq.) DC. l. c. (1824); Deless. Ic. Select. iii. 13. t. 21 (1837). — Santo Domingo: *Poiteau* (B); *Schomburgk* 11 (K); mountain woods, 1827, *Jacquemont* (K); woods, Sierra del Palo Quemado, 500 m., 10 May 1887, *Eggers* 1897 (BK); near Constanza, 1190 m., June 1910, *Tuerckheim* 3209 (BG). Also recorded by Britton from Haiti. — T. 1. Fig. 2.

4. P. **guantanamana**, nom. nov. Frutex vel arbusculus usque ad 4 m. altus, ramis foliosissimis, ramulis puberulis. Folia obovata vel obovato-oblanceolata puberula vel minute papilloso-puberula vel glabrata apice rotundata vel emarginulata basi angustata 15 mm. longa 4–8 mm. lata vel minora, in petiolis 1–1.5 mm. longis. Flores 2 mm. longi luteo-virescentes. Pedicelli frugiferi 1.5 mm. longi. Fructus 5 mm. longus, lobis anguste marginatis (fructu perfecto haud viso). — *Badiera virgata* Britton, Bull. Torr. Club xxxvii. 361 (1910), not *Polygala virgata* Thunb. — "Oriente, Camaguey, and Santa Clara, Cuba. (Type *Britton* 2086, from United States Naval Station, Guantanamo Bay, March 17–30, 1909)."

Description condensed from Britton, l. c. To this species I refer with little doubt *Wright* 3497 from Cuba (hb. Gray), which well agrees with the description except for its slightly larger leaves (19 by 11 mm.). This collection, which is in flower and young fruit, has merely ciliate sepals, glabrous pedicels 1.3–1.5 mm. long, and young fruit transversely oblong in outline, ciliate and sparsely

pubescent on sides toward margin. This number is nowhere quoted by Britton in either of his two revisions of *Badiera*.

5. P. **oblongata** (Britton), comb. nov. Frutex caule ramisque dense appresse puberulis. Folia oblonga vel obovato-oblonga vel elliptico-oblonga apice rotundata vel obtusa saepius retusa basi cuneata supra et infra in costa sparse strigillosa (pilis paginae inferioris minimis appressis) 1.5–2.8 (5) cm. longa 8–18 mm. lata. Flores pauci in racemis brevissimis 2 mm. longi. Fructus (submaturus) fere subquadrato-cuneatus sparsissime strigillosus et appresse ciliolatus, loculo uno plus minusve abortivo, 5 mm. longus 6 mm. latus; (paene maturus) " subtriangularis paullulum emarginatus ad 8 mm. longus et latus basi subacutus." — *Badiera oblongata* Britton, Bull. N. Y. Bot. Gard. v. 314 (1907); Bull. Torr. Club xxxvii. 362 (1910). *P. diversifolia* Chod. Monog. ii. 10 (1893), in part, not L. *P. diversifolia* f. *elliptica* and f. *obovata* Chod. l. c. 11 (1893), ex numero.—Bahamas: Andros Island: coppice, Smith Hill, Long Bay Cays Section, 23–24 Jan. 1910, *Small & Carter* 8681 (G); Bahamas without locality: 15 Oct. 1877, *Brace* 158 (K); 15 Oct. 1877, *Gov. Robinson* 313 (K). Cuba: Ganado, Cayo Sabinal, Camaguey, 17–18 Mar. 1909, *Shafer* 878 (G); Mayari to Holguin, 17 Aug. 1862, *Wright* 1915 (BG); Hunabana (= Guanabana ?), 29 Mar. 1862, *Wright* 1914 (BGK); near Monte Verde, Jan.-Jul. 1859, *Wright* 115 p. p. (G); eastern Cuba, 1856–57, *Wright* 115 p. p. (G).

6. P. **punctifera**, nom. nov. Frutex 1 m. altus, ramulis dense appresseque pubescentibus. Folia ovata vel ovato-elliptica obtusa vel emarginata basi obtusa valde punctata supra lucentia glabra subtus obscura 1.5–2.5 cm. longa, 12 mm. lata vel angustiora, in petiolis 1.5 mm. longis. Racemi pauciflori, pedicellis frugiferis subglabris 2–2.5 mm. longis. Sepala ovata obtusa ciliata ad 1 mm. longa. Fructus (submaturus) " ruber et viridis " 7 mm. longus latusque, apice emarginatus basi oblique subtruncatus anguste marginatus, paullum pubescens, stipe 1–1.5 mm. longo. — *Badiera punctata* Britton, Bull. Torr. Club xlii. 496 (1915), not *P. punctata* A. W. Benn. Journ. Bot. xvii. 172 (1879). — " Near streams, Arroyo del Medio above the falls, Oriente, Cuba (*Shafer* 3644)." — Not seen; description compiled. The leaves are said to droop at night in this species and in *P. guantanamana* (*B. virgata*).

7. P. **portoricensis** (Britton), comb. nov. Arbor usque ad 6 m. altus 1.5 dm. (" 1.5 m.") dimetente, ramulis appresse pubescentibus. Folia obovata apice rotundata vel obtusa basi angustata vel cuneata supra lucentia subtus obscura utrinque sparse breviterque pubescentia aetate glabrata 3 cm. longa 7–15 mm. lata vel minora, in petiolis 1–2.5 mm. longis. Racemi 4–6 mm. longi; pedicelli appresse pubescentes 1.5–2.5 mm. longi. Sepala late ovata obtusa ciliata 1 mm. longa vel minora. Carina 2 mm. longa appresse pubescens. Petala superiora alba. Fructus minute pubescens anguste marginatus apice emarginatus basi subtruncatus ad 5 mm. longus 6 mm. latus, in stipe 0.6 mm. longo. — *Badiera portoricensis* Britton, Bull. Torr. Club xlii. 494 (1915). — " Rocky slopes and hillsides, western Porto Rico, especially on serpentine, from sea-level to 700 m. altitude. Type collected at Guanajibo, near Mayaguez (*Britton, Cowell, & Brown* 4349)." — Not seen; description compiled. The only Porto Rican species of this subgenus yet known.

8. P. JAMAICENSIS Chod. Shrub or small tree, 2.6–6 m. high, the stem and branches densely appressed-puberulous, at length glabrate. Leaves ovate to ovate-lanceolate or oval-ovate, mostly narrowed (often abruptly) to the obtuse often retuse apex, cuneate at base, sparsely minutely strigillose both sides, 3.5–8 cm. long, 1.3–3.7 cm. wide, on appressed-puberulous petioles 3–5 mm. long. Peduncle 1–1.5 mm. long; pedicels in fruit 2–3.5 mm. long. Flowers 2.5 mm. long. Fruit subquadrate, sparsely ciliolate, 6.5–10 mm. long, 7–11 mm. wide, the stipe 2.5 mm. long. Seed 6 mm. long. — Chod.! l. c. ii. 11. t. 13. f. 14 (1893). *Badiera diversifolia* (L.) DC. Prod. i. 334 (1824), but not *Polygala diversifolia* L., the name-bringing synonym, which is *Securidaca volubilis* L.!; Britton, Bull. Torr. Club xxxvii. 362 (1910), and xlii. 495 (1915), not *Polygala diversifolia* L. — JAMAICA: *Patrick Browne* (B); *Wm. Wright* (B); *Olaf Swartz* (B); *March* 68 (K), 627 (K), 726 (GK), 1656 (GK), 1822 (K); White River, 1 Jan. 1850, *R. C. Alexander* (K); arid rocks on coast (?), Manchester, Nov. 1843, *Purdie* (K); Malvern, 670 m., 3 Sept. 1907, *Harris* 9651 (BJK); Bridge Hill, 455 m., 19 Jan. 1898, *Harris* 7092 (BJ); near Old England, 1065 m., 9 Aug. 1895, *Harris* 5838 (BJ); Rock Fort, *J. Hart* 641 (TYPE COLL.: J); Old England, 915 m., 16 Sept. 1896, *Harris* 6597 (J); near Ewarton, 290 m., 24 Nov. 1896 (J). — T. 1. FIG. 3.

Linnaeus's *Polygala diversifolia* was based solely on a Cliffortian specimen, now in the British Museum, of *Securidaca volubilis* L., of which it becomes a synonym.

9. P. **stipitata**, nom. nov. Frutex ramosus 1.3–2 m. altus, ramulis dense strigillosis. Folia ovata apicem versus saepissime abrupte breviterque acuminata vel acutata apice calloso-mucronata interdum emarginata basi acute cuneata supra plus minusve nitentia subsparse strigillosa subtus vix pallidiora sparse strigillosa aetate subglabrata coriacea, nervis lateralibus 5–7-jugis, 4–6.3 cm. longa 2.1–3.3 cm. lata, in petiolis appresse puberulis 2–3.5 mm. longis. Racemi axillares pauciflori, axe 1.5–2.5 mm. longo, pedicellis frugiferis 2–2.8 mm. longis. Flores ut dicitur " viridescentes." Sepala orbiculari-ovata rotundata ciliolata ceterum subglabra 1 mm. longa lataque. Alae consimiles 1.5 mm. longi. Carina in lateribus et basi pubescens 2.4 mm. longa. Petala superiora obovata infra pubescentia carinam subaequantia. Fructus transverse oblongus sparse ciliolatus 8–9 mm. longus 11–14 mm. latus, in stipem 2–2.5 mm. longum desinens, vix per quintam partem longitudinis lobatus; loculi patentes (uno saepe abortivo). — *P. diversifolia* Chod. Monog. ii. 10 (1893), in part, not L. *Badiera cubensis* Britton! Bull. Torr. Club xxxvii. 362 (1910), as to description and specimens, in part; Britton, l. c. xlii. 495 (1915); not *Polygala cubensis* Chod. Monog. ii. 62 (1893). — CUBA: Chuico Azal (?), Bahia Honda, 23 Sept. 1863, *Wright* 1913 p. p. (COTYPE COLL.: G); savannas, Embarcaden di Bacunagua, San Cristobal, 6 April, *Wright* 1913 p. p. (COTYPE COLL.: G). — T. 1. FIG. 4.

Badiera cubensis Britton was originally based on *Wright* 1913, with which were placed *Wright* 3496, and 115 pro parte. In his 1915 revision (p. 495) Dr. Britton says, under *B. cubensis*: " C. Wright's Cuban 1915 consists, apparently, of three species; it is to the specimen with abruptly acuminate leaves cuneate-narrowed at the base, 4–6 cm. long, that the name should be restricted. As shown by specimens from Bahia Honda, Pinar del Rio (*P. Wilson* 9429) the leaves vary to obovate." On the next page, in describing *B. propinqua* sp. nov., Britton says: " The description is drawn to include the part of *Wright* 1913, and *Wright* 3496, previously referred by me to B. *cubensis*. The part of *Wright* 115, included by me in the original description of *B. cubensis*, is perhaps referable here also." There is no essential difference in the descriptions of

the two species, the extremely important characters of the fruit being practically the same in both, so far as description goes, the capsule being described as "7.5–8.5 mm. long, 10 mm. wide, lobed to about one-third" in *B. cubensis* (1910), and "10 mm. wide, 7 mm. long, deeply notched" in *B. propinqua* (1915). Only Britton's designation of the large-leaved form included under *Wright* 1913 as type can justify the reference of *B. cubensis* to *P. stipitata* as a synonym, for the description, at least as to fruit, is distinctly of *P. propinqua*.

10. P. **montana** (Britton), comb. nov. Frutex 3 m. altus, ramulis dense puberulis. Folia late ovalia apice rotundata vel emarginulata basi acuta juventate dense maturitate sparse puberula 4–5 cm. longa 2.5–3.5 cm. lata, in petiolis 2–3 mm. longis. Pedicelli frugiferi pubescentes 1.5–2 mm. longi. Fructus 8–10 mm. longus 10–12 mm. latus puberulus per quintam partem longtudinis lobatus, loculis rotundato-truncatis, stipe 1 mm. longo. — *Badiera montana* Britton, Bull. Torr. Club xxxvii. 363 (1910); l. c. xlii. 495 (1915). — "Rocky wooded hill, Arroyo Grande, Trinadad Mountains, Cuba, at about 700 meters altitude (*Britton & Wilson* 5461, March 11, 12, 1910)." — Not seen; description compiled.

11. P. **propinqua** (Britton), comb. nov. Frutex valde ramosus 3.3 m. altus, ramulis dense apresse puberulis. Folia ovalia vel ovali-ovata apice saepius emarginata rotundata vel obtusa basi cuneata supra strigillosa subtus vix pallidiora minute punctato-strigillosa, nervis lateralibus 3–4-jugis, 2.3–3.6 cm. longa 1.1–2.3 cm. lata, in petiolis subappresse puberulis 1.5–3 mm. longis. Racemi pauciflori, axe ad 1 mm. longo, pedicellis frugiferis 1.5–2 mm. longis. Flores viridescentes. Carina 2.5 mm. longa. Fructus per tertiam partem longitudinis lobatus, maturitate sparsissime pubescens, 7–7.5 mm. longus 9.5–10 mm. latus, in stipem 2–2.5 mm. longum desinens. — *P. diversifolia* Chod. Monog. ii. 10 (1893), in part, not L. *Badiera cubensis* Britton, Bull. Torr. Club xxxvii. 362 (1910), in part. *Badiera propinqua* Britton, Bull. Torr. Club xlii. 495 (1915). — Cuba: mountain top, Vinales, 6 March, *Wright* 1913 p. p. (G); without locality, *Wright* 3496 (G). Britton's type (*Shafer* 11818) came from Pinar del Rio. — T. 1. Fig. 5.

12. P. **dimorphophylla**, nom. nov. Frutex 6 m. altus, ramulis breviter subpatenter pubescentibus. Folia dimorpha: alia anguste ovata subacuta 3–4 cm. longa 1.2–1.8 cm. lata; alia elliptica apice

rotundata vel obtusa 2–2.5 cm. longa 1.2–1.4 cm. lata; omnia apice emarginata basi angustata vel obtusa utrinque sparse breviter pubescentia et obscura, in petiolis appresse pubescentibus 2 mm. longis. Racemi ca. 5 mm. longi; pedicelli frugiferi pubescentes ad 2 mm. longi. Flores flavi. Fructus ca. 5 mm. altus 7–8 mm. latus, valde lobatus juventate sparse pubescens maturitate glabratus in stipem 1.5 mm. longum desinens. — *Badiera heterophylla* Britton, Bull. Torr. Club xlii. 496 (1915), not *Polygala heterophylla* Scheele, Linn. xvii. 336 (1843). — "Deciduous woods, Sierra Nipe, near Woodfred, Oriente, at 450–550 m. altitude (*Shafer* 3070)." — Not seen; description compiled.

13. P. **Fuertesii** (Urb.), comb. nov. Much-branched tree, the branches puberulent with appressed hairs, more or less angulate by decurrent lines from the petiole bases. Leaves oval to suborbicular, obtuse at apex, rounded to rounded-cuneate at base, firmly coriaceous, above dark green, shiny, reticulate, glabrous or sparsely strigillose, beneath paler, dotted, sparsely strigillose or nearly glabrous, 3–4 cm. long, 1.8–2.9 cm. wide; petioles finely puberulous, 4–5 mm. long. Racemes 1.2–1.5 cm. long (including the 3.1–6 mm. long peduncle), loosely flowered, strigillose; flowers 5–16, greenish, the petals whitish; pedicels stoutish, sparsely strigillose, 1.5–2 mm. long. Sepals elliptic, rounded, more or less appressed-puberulous and ciliate, 1.3 mm. long. Wings 1.7 mm. long, rhombic-suborbicular. Keel 2.8 mm. long, densely pubescent laterally. Fruit unknown. — *Badiera Fuertesii* Urb.! Sym. Antill. vii. 244 (1912). — SANTO DOMINGO: summit of Mt. Noche Buena, 1800 m., Prov. Barahona, Sept. 1911, *Fuertes* 1065 (TYPE COLL.: BG).

Subgenus III. **HEBECARPA** (Chod.), comb. nov.

Sepals free, deciduous (rarely persistent), herbaceous, or in Sect. *Biloba* the two lower petaloid. Wings petaloid, oval to oblong, deciduous (except in Sect. *Huateca*), about equalling keel or longer. Keel blunt, somewhat 3-lobed, crestless, beakless, adnate to the staminal tube for one-half its length or more. Upper petals obliquely oblong, adnate below to the staminal tube. Stamens 8, the glabrous or pubescent filaments distinct for about one-third their length. Ovary more or less pubescent or ciliate; style much longer than ovary, bent; stigmatic lobes approximate, sometimes

tufted at base. Capsule membranous-herbaceous, equally 2-celled, narrowly winged or margined. Seeds densely pubescent (very rarely glabrous), oblong-oval. Aril very varied, subentire or strongly lobed, appressed or spreading, with narrow or broad scarious margin, with a corneous subhemispheric or sometimes much reduced pubescent rarely glabrous umbo. — Suffrutescent or herbaceous perennials, with small or medium usually purplish flowers in terminal and axillary racemes, these often becoming apparently extra-axillary by the development of axillary branches. — *Polygala* L. sect. *Hebecarpa* Chod. Arch. Sci. Phys. Nat. Genève xxv. 698 (1891); Monog. ii. 9 (1893), excl. *Badiera* DC.

a. Sepals herbaceous, caducous like the wings (except in nos. 15–16); aril pubescent at least at apex, *b* Sect. 1. . . . . Euhebecarpa.
b. Capsule and leaves bearing large glands.
Subsect. C. Adenophora, p. 54.
b. Capsule and leaves not glandular, *c*.
c. Leaves comparatively large (mostly 2–6 by 1–3 cm.), ovate, acute or rarely obtuse, gradually reduced upwardly, not noticeably dimorphous . . . . . .
Subsect. B. Hebantha, p. 37.
c. Leaves smaller, usually dimorphous (lower shorter, oval or oblong-oval, upper oblong to linear, longer), or uniform, elliptic to ovate, smaller than in Subsect. *Hebantha* . . . . . Subsect. A. Microthrix.
d. Leaves nearly uniform (the upper slightly smaller), oval or ovate . . . . . Ser. *α*. Ovatifoliae.
d. Leaves more or less dimorphous, the lower oval or oblong-oval, the upper considerably longer, oblong to linear . . . . . Ser. *β*. Obscurae, p. 22.
a. Lower sepals petaloid, deciduous, the upper one herbaceous, persistent; wings deciduous; aril glabrous . . . Sect. 2. Biloba, p. 57.
a. Sepals and wings persistent, the sepals herbaceous.
Sect. 3. Huateca, p. 58.

Sect. 1. **Euhebecarpa** (Chod.), comb. nov. Sepala herbacea decidua rarissime persistentia vel subpersistentia; alae deciduae rarissime subpersistentes; arillus variabilis apice pubescens. — *Polygala* L. sect. *Hebecarpa* Chod. subsect. *Euhebecarpa* Chod. Monog. ii. 12 (1893). Species typica *P. obscura* Benth.

Subsect. A. **Microthrix,** subsect. nov. Arilli umbo saepius magnus; folia uniformia ovalia vel late ovata (1.3–3 cm. longa 6–16 mm. lata), vel distincte biformia, inferiore oblongo-ovalia vel ovalia superiora linearia vel oblongo-linearia longiora. Species typica *P. obscura* Benth.

Series *α*. **Ovatifoliae**, ser. nov.[1] Folia uniformia (sursum sensim reducta) ovalia vel ovata. Species typica *P. ovatifolia* Gray.

[1] *P. appressipilis* (no. 45) might be sought here.

a. Plant densely and shortly pilose-hirsute with spreading hairs, *b.*
b. Capsule merely ciliate; wings shorter than keel . . . . . 14. *P. ovatifolia.*
b. Capsule puberulous on sides; wings longer than keel . . 15. *P. buxifolia.*
a. Hairs incurved or appressed, *c.*
c. Wings subpersistent . . . . . 16. *P. myrtilloides.*
c. Wings quickly deciduous, *d.*
d. Leaves oval or elliptic, obtuse or rounded, *e.*
e. Flowers 3.8 mm. long . . . . . 17. *P. Robinsonii.*
e. Flowers 6–6.5 mm. long . . . . . 18. *P. Xanti.*
d. Leaves ovate, acuminate . . . . . 19. *P. serpens.*

14. P. OVATIFOLIA Gray. Suffrutescent at base, branched, erect, 3 dm. or less high, the stem and branches, raceme-axes and pedicels densely softly pilose with wide-spreading hairs. Leaves ovate (on the branches sometimes ovate-oblong), acutish rarely obtuse, with often obliquely bent apex, rounded or cuneate at base, with 2–3 pairs of lateral veins, not reticulate, rather densely short-pilose both sides with spreading hairs, 1.2–3 cm. long, 0.6–1.3 cm. wide, on shortly spreading-pilose petioles 2 mm. or less long. Racemes rather loose, 2–6.5 cm. long. Flowers 7.5–8 mm. long. Sepals ovate-lanceolate, acute, 3 mm. long, pilose like the 4–5 mm. long oblong to oval abruptly short-pointed soon deciduous wings. Capsule marginally ciliate, orbicular, 8.5–9 mm. long, 8.5–9 mm. wide. Seed 4 mm. long. Aril medium, with rather broad lobed and lobulate scarous margin. — Gray! Pl. Wright. i. 39 (1852); Chod. Monog. ii. 19. t. 13. f. 26–30 (1893); Rob. in Gray, Syn. Fl. i. pt. 1. 450 (1897). *P. ovalifolia* Gray! Pl. Lindh. ii. (Journ. Bost. Soc. Nat. Hist. vi.) 151 (1850), in text, not DC.; Wheelock, Mem. Torr. Club ii. 148 (1891), by cler. err. — NUEVO LEON: Monterey, *Edwards & Eaton* (GK); Monterey, 1880, *Palmer* 65 (GK). Also in Texas and New Mexico: *Wright* 71 (K), 103 (TYPE COLL.: BGK), 935 (BG); *Mex. Bound. Survey under Emory* 191 (K). — T. 1. FIG. 6.

15. P. BUXIFOLIA HBK. Similar in habit and pubescence. Leaves elliptic or the upper ovate, obtuse, rounded, or retuse at apex, the upper sometimes acutish, rounded to cuneate at base, reticulate beneath, pubescent as in *P. ovatifolia* or sometimes with more or less incurved hairs, the lower 1.3–1.9 cm. long, 7.5–12 mm. wide. Flowers 5.5 mm. long. Wings obovate-oval, short-pilose, rounded at apex, subpersistent, 5.5 mm. long. Keel 4–4.5 mm. long. Capsule oval, slightly oblique at apex, densely pilosulous, 8 mm. long, 6.5 mm. wide. Aril with broader scarious margin and distinct short barely lobulate lateral and spreading dorsal lobes. —

Nov. Gen. v. 407 (1821). *P. ovalifolia* DC. Prod. i. 331 (1824). — San Luis Potosi: San Rafael Mts., Aug. 1877, *Schaffner* 7 p. p. (GK); without definite locality, *Schaffner* 495 p. p. (B); alt. 1830–2440 m., 1878, *Parry & Palmer* 43 p. p. (BK). — T. 1. Fig. 7.

16. P. myrtilloides Willd. Fruticulose at base, many-stemmed, the stems erectish, branched, up to 1.8 dm. high, like the branches, raceme-axes, and pedicels densely puberulous with subappressed hairs. Leaves elliptic to oblong-oval or oval-ovate, the uppermost sometimes oblong, retuse, obtuse, or acutish at apex, cuneate to rounded at base, subcoriaceous, reticulate below, subdensely pubescent on both faces with short subappressed hairs, the larger 1.5–2 cm. long, 6–12 mm. wide. Racemes loosely flowered, 2 cm. long. Flowers 4–8. Sepals ovate-lanceolate to linear-lanceolate, acuminate, sparsely incurved-puberulous, 4 mm. long. Wings obovate-oval, obtuse or rounded at apex, incurved-puberulous, 5.5–6.5 mm. long, 2.8–3.5 mm. wide, both sepals and wings subpersistent. Keel greenish, 4.5 mm. long. Capsule elliptic, subdensely incurved-puberulous and ciliolate, 6.5–7 mm. long, 6 mm. wide. Seed 4 mm. long, shortly pilose. Aril broadly scarious-margined, three-lobed, the lateral lobes oblong, oblique, somewhat dilated at apex, the dorsal short, horizontal. — Sp. Pl. iii. 889 (1803); Chod. Monog. ii. 18 (1893), pro parte. — San Luis Potosi: San Rafael Mts., Aug. 1877, *Schaffner* 7 p. p. (K); without locality, *Schaffner* 495 p. p. (B); 1830–2440 m., 1878, *Parry & Palmer* 43 p. p. (GK). Hidalgo: Sierra de Pachuca, alt. 2745 m., 22 July 1898, *Pringle* 7654 (G). — T. 1. Fig. 8. — Chodat's figures (t. 13. f. 23–24) surely are not of the species as here taken.

17. P. **Robinsonii,** nom. nov. Perennial, scarcely suffrutescent, with 1–3 slender stems 3–7 cm. high, simple or subsimple, appressed-puberulous like the raceme-axes and pedicels. Leaves few, elliptic or the upper oval-oblong, rounded to obtuse at the slightly mucronulate apex, cuneate to rounded at base, rather thin, with 1–2 pairs of lateral nerves, not reticulate, purplish on under side, densely appressed-puberulous both sides, the larger 1.3–2.3 cm. long, 8–16 mm. wide. Racemes few-flowered, 1.3–2.3 cm. long. Sepals lanceolate, subpetaloid, magenta-tinted, incurved-pilosulous, shorter than wings, soon deciduous. Alae oblong, obtuse, sparsely incurved-pilosulous, magenta-color, 3.8 mm. long. Keel yellowish, 3 mm. long. Capsule orbicular, purpurascent, incurved-

pilosulous, 5 mm. long, 4.2 mm. wide. Seed 3.5 mm. long. Aril minute, 0.5 mm. long, with obsolescent barely lobulate scarious margin and large pubescent umbo. — *P. puberula* Gray var. *ovalis* Rob. & Greenm.! Proc. Am. Acad. xxix. 382 (1894); not *P. ovalis* E. Mey. in Drège, Zwei Pfl. Doc. (Flora xxvi. Beig.) 45, 212 (1843), nomen. — JALISCO: damp hollows of hills near Guadalajara, 18 July 1893, *Pringle* 4472 (TYPE COLL.: BGK). — T. 1. FIG. 9.

The date of collection of the type collection was originally recorded as 22 May, and is given on the labels as 17 July, but Prof. G. P. Burns, who has kindly consulted for me the Pringle field books, writes that the correct date is 18 July.

18. P. XANTI Gray. Similar in habit to *P. buxifolia*, the branches procumbent or erectish, about 13 cm. long, densely pubescent with spreading-incurved hairs. Leaves oval, rounded at apex and base, with 1–2 pairs of lateral nerves, not reticulate, densely pubescent both sides with short incurved-spreading hairs, 9–13 mm. long, 5–8.5 mm. wide, on petioles 1 mm. long. Racemes 1.8–3 cm. long. Flowers " white, tinged with yellow and purple," 6–6.5 mm. long. Wings venose, somewhat rhombic-oval, rounded at apex, pilose except near margin with short incurved-spreading hairs, 5.5 mm. long. Capsule elliptic-ovate, notched at apex, rounded at base, densely pubescent like stem, 7 mm. long, 4.3 mm. wide, on a distinct stipe about 0.8 mm. long. Seed not seen. — Gray! Proc. Am. Acad. v. 153 (1861–62); *P. Xanthi* Chod. Monog. ii. 18. t. 15. f. 43–45. (1893).—LOWER CALIFORNIA: Cape San Lucas, 1859–60, *Xantus* 3 (TYPE COLL.: GK). — *Brandegee* 21, Todos Santos, 21 Jan. 1890, distributed as *P. Xanti* is not this species, but the material in the Gray Herbarium is too imperfect for determination.

19. P. **serpens,** sp. nov. Suffruticulosa multicaulis. Caules procumbentes plus minusve flexuosi ramosi 8–30 cm. longi tenues subdense incurvo-puberuli. Folia ovata acuminata basi rotundata tenuia nervis lateralibus 3–4-jugis non reticulatis supra obscure viridia subsparse pubescentia pilis longiusculis incurvo-patentibus subtus vix pallidiora subdense incurvo-puberula pilis paucis longioribus intermixtis 1.5–2.8 cm. longa 8–13 mm. lata, in petiolis incurvo-puberulis 1–1.5 mm. longis. Racemi subflexuosi laxiflori 2–2.5 cm. longi. Flores 5–12 ut videtur ochroleuci. Sepala lanceolata acuminata ciliolata et sparse puberula plus minusve curvata 2.6 mm.

longa. Alae ellipticae apice obtusae vel rotundatae basi late cuneatae ad costam sparse puberulae 5.5–7 mm. longae 4 mm. latae. Petala superiora obovata infra ciliata ad 3.8 mm. longa. Carina glabra 4.5–4.8 mm. longa. Capsula deltoideo-ovata sursum manifeste angustata basi truncato-rotundata ciliata et in lateribus puberula pilis brevibus patentibus emarginata 5.5–7 mm. longa 5–6 mm. lata. Semina cuneato-obovoidea breviter pilosa rugulosa 4 mm. longa 2.6 mm. lata. Arillus capitelliformis minutus ad 0.5 mm. altus pilosus margine scarioso obsoleto. — GUERRERO: Acapulco, Oct. 1894–Mar. 1895, *Palmer* 168 (TYPE COLL.: GK). — T. 1. FIG. 10. — Very distinct in capsule and seed. Distributed as *P. americana* Mill.

Series *β*. **Obscurae,** ser. nov.[1] Folia saepissime biformia, inferiora saepissime ovalia ad oblongo-ovalia superiora saepissime longiora angustiora saepius linearia vel oblongo-linearia. Species typica *P. obscura* Benth.

a. Capsule more or less pubescent on sides at maturity, *b*.
  b. Hairs of stem all incurved or appressed, *c*.
    c. Aril minute, capitelliform, scarcely lobed, *d*.
      d. Flowers 4–5 mm. long ..... 22. *P. magdalenae*.
      d. Flowers 6–7 mm. long ..... 23. *P. leptosperma*.
    c. Aril larger, distinctly lobed or lobulate, *e*.
      e. Aril strongly 3-lobed, the lobes more or less appressed, slender, *f*.
        f. Flowers 4–5 mm. long ..... 38. *P. compacta*.
        f. Flowers 6–7 mm. long ..... 39. *P. polymorpha*.
      e. Aril veil-like, merely lobulate, *g*.
        g. Sepals and wings quickly deciduous ..... 32. *P. obscura*.
        g. Upper sepal and wings rather persistent ..... 34. *P. Lozani*.
  b. Hairs of stem (at least in part) wide-spreading, *h*.
    h. Leaves dimorphous (lower oval to oblong-oval, upper oblong to lanceolate or linear), not reticulate; hairs all short and spreading ..... 32.1. *P. orthotricha*.
    h. Leaves not dimorphous, linear-lanceolate, strongly reticulate; pubescence of short incurved and long patent hairs ..... 31. *P. retifolia*.
    h. Leaves lanceolate to linear-lanceolate, subtomentose-velutinous ..... 23. *P. leptosperma*.
a. Capsule merely ciliate at maturity, *i*.
  i. Wings glabrous ..... 20. *P. Pavoni*.
  i. Wings pubescent at least at base, *j*.
    j. Aril small, the depth of the entire or merely denticulate-lobulate scarious margin less than the height of the corneous umbo, *k*.
      k. Pubescence of short widely spreading hairs ..... 27.1. *P. rectipilis*.
      k. Hairs incurved or appressed, *l*.

[1] *P. amphothrix* (no. 42), *P. chiapensis* (no. 44), and *P. trichoptera* (no. 62) might be sought here.

l. Middle leaves obovate-oblong, 4.5–7 mm. wide..28. *P. Palmeri.*
l. Middle leaves linear or linear-lanceolate, 1–3 mm. wide, *m*.
m. Upper leaves more or less reduced, 4.5–10 (22) mm. long, *n*.
n. Aril with more or less distinct dorsal lobe, raised on the constricted apex of the seed 24. *P. Barbeyana.*
n. Aril without distinct dorsal lobe, subsessile, *o*.
o. Umbo densely pilose.....27. *P. intricata.*
o. Umbo nearly glabrous.....26. *P. zacatecana.*
m. Upper leaves not reduced, 1.5–3.1 cm. long....29. *P. racemosa.*
j. Aril larger, the depth of its more or less lobed or lobulate scarious margin equalling or exceeding the height of the umbo, *p*.
p. Aril with 3 slender appressed lobes about $\frac{1}{3}$ as long as seed .....38.1. *P. tenuiloba.*
p. Aril not divided into 3 slender lobes, *q*.
q. Aril veil-like, with broad scarious lobulate margin covering the upper $\frac{1}{3}$–$\frac{3}{5}$ of seed, the dorsal margin vertically descending, the lower margin nearly or quite horizontal, *r*.
r. Sepals and wings quickly deciduous.....32. *P. obscura.*
r. Wings and upper sepal rather persistent.....34. *P. Lozani.*
q. Aril otherwise, *s*.
s. Upper leaves ovate to elliptic-oblong, *t*.
t. Wings 6–6.5 mm. long.....36. *P. oophylla.*
t. Wings 4–5 mm. long, *u*.
u. Scarious border of aril distinctly deeper than height of umbo; keel yellowish-green.....37. *P. Brandegeeana.*
u. Scarious border of aril barely as deep as height of umbo; keel purplish..35. *P. brachyanthema.*
s. Upper leaves linear to oblong-lanceolate, *v*.
v. Upper leaves reduced, 5–14 (23) mm. long...25. *P. reducta.*
v. Upper leaves not reduced, 1.7–3.6 cm. long....30. *P. longa.*

(*P. Conzattii* Rose (no. 21) and *P. oaxacana* Chod. (no. 33) have not been inserted in the key owing to lack of information.)

20. P. Pavoni Chod. Undershrub, the stems puberulous, ascending, divaricately branched, 1–2 dm. long. Leaves elliptic or elliptic-ovate, obtuse, "irregularia et diversa," puberulous, 20 mm. long, 12 mm. wide. Racemes few-flowered. Flowers 5–6 mm. long. Sepals lance-linear, acute, pubescent. Wings elliptic, subsessile, obtuse, glabrous, reticulate-veined. Upper petals dilated at apex, subacute, scarcely shorter than keel. Staminal tube and free portions of filaments long-pilose. Ovary elliptic, ciliate. Capsule and seed unknown. — Chod. Monog. ii. 14 (1893).

Not seen; description compiled. Based by Chodat on a Pavon specimen (hb. Boiss.) said to have been collected in Mexico. A specimen of Pavon's in the British Museum, so labelled by Chodat, has obviously nothing to do with this species as originally described.

The species, if really Mexican, may perhaps belong in the *Ovatifoliae* but is placed in this series on account of Chodat's description of the leaves as "irregularia et diversa."

21. P. Conzattii Rose. Slender, up to 4 dm. high or more, clothed with short crisp hairs. Leaves shortly oblong, obtuse, narrowed into a distinct petiole, sparsely pubescent, 2 cm. long or less. Raceme elongate, slender; bracts ovate, puberulent on back, persistent; pedicels 3–4 mm. long. Flowers pinkish. Sepals glabrous, the upper one persistent. Fruit orbicular, or sometimes broader than long, retuse, at first densely pubescent, soon glabrate, 3–4 mm. broad. — Rose, Contr. U. S. Nat. Herb. xiii. 307 (1911). — "Type . . . collected by C. Conzatti on Cerro San Antonio, Oaxaca, Mexico, October 28, 1908 (no. 1587)." — Not seen; description compiled. The place of this species in the section cannot satisfactorily be made out from its description.

22. P. magdalenae Brandegee. Stems "prostrate," sparsely branched, 1–3 dm. long, like the inflorescence griseous-puberulous with incurved hairs. Lowest leaves oval-oblong, obtuse, short-petioled, rather densely puberulous with incurved hairs, 7 mm. long, 4 mm. wide; middle and upper oblong or oblong-ovate to linear, acutish, mucronulate, cuneate or acute at base, with 1–3 pairs of lateral nerves, not reticulate, rather densely puberulous with incurved hairs, 1.2–2 cm. long, 2–8 mm. wide, on petioles 1 mm. long. Racemes loosely flowered, 4–10.5 cm. long. Flowers ochroleucous. Sepals lanceolate, acute, pilosulous with somewhat incurved hairs, 2 mm. long. Wings narrowly obovate-oval, obtuse, puberulous above, 4.5 mm. long, 2.8 mm. wide. Keel 3.5–4 mm. long. Upper petals obliquely oblong, nearly glabrous, apparently violet-tinged, 3 mm. long. Capsule elliptic, with nearly closed apical sinus, more or less densely appressed-puberulous, 7.5–9.5 mm. long, 6–7 mm. wide. Seed wedge-obovoid, pilose, 4 mm. long. Aril minute, 0.7 mm. long, with pubescent umbo and very narrow barely crenate scarious margin. — Brandeg. Univ. Calif. Pub. Bot. iv. 182 (1911). — Lower California: sunny hills, San José del Cabo, Jan.–Mar. 1901, *Purpus* 391 (K).

23. P. leptosperma Chod. Stem suffrutescent at base, sparsely branched, 12 cm. long, hirsute-tomentose above. Leaves lanceolate to lance-linear, acute, subtomentose-velutinous, 1.5–2.2 cm. long, 7–9 mm. wide. Racemes terminal, rather loosely flowered.

Flowers 6–7 mm. long, on setose pedicels 1.5–2.5 mm. long, the hairs arcuate, as long as or longer than the diameter of the pedicel. Sepals lance-linear-subulate, setose-ciliate. Wings elliptic-lanceolate, subacute, subunguiculate, equalling keel, long-ciliate on margin and back. Upper petals linear, "attenuate" at apex, "subacute" (but not so represented in figure), one-third shorter than keel. Filaments pilose. Capsule ovate-cuneate, broadest above base, narrowed gradually toward apex, hispid, deeply emarginate. Seed pilose. Aril small, capitelliform, the very narrow scarious crenate margin with very short upturned dorsal lobe and no lateral lobes. — Chod. Monog. ii. 17. t. 13. f. 19–22 (1893). — Described by Chodat from *Galeotti* 899, Cosamalopan, and *Jurgensen* 191, Pinotepa nacional, Oaxaca (hb. Brux. et Par.). — Not seen; description compiled.

24. P. Barbeyana Chod. Stems several, erect from a fruticulose base, simple or generally somewhat branched, up to 4 dm. high, like the inflorescence densely pubescent with incurved hairs or at length subglabrate. Leaves reduced: the lowest oblong, mucronate, subsessile, 5 mm. long, 1.5 mm. wide; middle and upper subsquamiform, linear or linear-lanceolate, acute at each end, pubescent like the stem, 5–10 mm. long, 1–1.5 mm. wide, subsessile. Racemes laxly flowered, 1.7–11 cm. long. Sepals lanceolate, acuminate, pubescent, violet-tinged, 2.6 mm. long. Wings obovate-oval or suborbicular-oval, acutish, pubescent along middle and toward apex, ciliate, 3.6–4.5 mm. long, 2.5–3 mm. wide. Keel nearly or quite glabrous, 3.5–4.5 mm. long. Capsule elliptic (rarely elliptic-oblong), slightly narrowed at base, emarginate, ciliate, glabrous on sides, purpurascent on margin, 5–7.1 mm. long, 3.1–5.5 mm. wide. Seed sericeous, 3 mm. long. Aril small, about 0.7 mm. deep, cap-shaped, subpedicellate by the apex of the seed, with narrow not lobed scarious margin. — Chod.! Monog. ii. 16. t. 13. f. 15–18 (1893); Chod. Bull. Herb. Boiss. iii. 121 (1895). — Coahuila: Saltillo, May 1898, *Palmer* 165 p. p. (G). San Luis Potosi: shady places near Morales, Aug. 1877, *Schaffner* 3 (GK); alt. 1830–2440 m., 1878, *Parry & Palmer* 41 (cotype coll.: GK). — T. 1. Fig. 11.

25. P. **reducta,** sp. nov. Suffruticulosa erectiuscula 1.5–1.7 dm. alta, caulibus simplicibus vel sparse ramosis tenuibus cum ramis et inflorescentia subdense incurvo-puberulis. Folia inferiora ovali-oblonga obtusa vel acuta brevissime petiolata 1-nervia incurvo-

puberula 5–9 mm. longa 2–3 mm. lata; media et superiora lanceolata vel linearia obtusa vel acuta plus minsve involuta mucronata sessilia 5–14 (23) mm. longa 0.5–2 mm. lata. Racemi laxissimiflori 6–9 cm. longi. Sepalum superius longius lanceolatum inferiora lanceolata acuta pubescentia et ciliolata. Alae elliptico-obovatae obtusatae in basin abrupte contractae sparse pubescentes 4.5–5 mm. longae 3–4 mm. latae. Carina 4.5–5 mm. longa. Capsula elliptica ciliolata in lateribus glabra marginaliter purpurascens 8–9.5 mm. longa 6–7 mm. lata. Semen pilosum 4.5–5 mm. longum. Arillus majusculus 1 mm. altus, lobo dorsali patente (margine dorsali 1.5 mm. longo), lobis lateralibus brevibus subintegris. — San Luis Potosi: alt. 1830–2440 m., 1878, *Parry & Palmer* 44 (type coll.: GK); do., *Parry & Palmer* 41–44 (B). Coahuila: Saltillo, May 1898, *Palmer* 165 p. p. (G). Nuevo Leon: Monterey, Feb. 1880, *Palmer* (G). Zacatecas: near Conception del Oro, 11–14 Aug. 1904, *Palmer* 255 p. p. (G); Cedros, Apr. 1908, *F. E. Lloyd* 90 (G). — T. 1. Fig. 12.

26. P. **zacatecana,** sp. nov. Suffruticulosa erecta ramosa 1–1.3 dm. alta. Caules ut rami inflorescentiaque appresse griseo-puberuli. Folia subsquamiformia inferiora oblonga vel ovalia obtusa 1-nervia crassiuscula sparse puberula brevissime petiolata 4–5 mm. longa 1.5–1.8 mm. lata; superiora duriuscule mucronulata plus minusve involuta crassa subenervia plus minusve puberula 4.5–10 mm. longa 0.8–1 mm. lata. Racemi laxe 9–18-flori 2–5 cm. longi. Sepalum superius longius lanceolatum acuminatum inferiora lanceolata acuta sparse pilosula et ciliolata. Alae ovali-obovatae apice rotundatae in medio dorsi et ad apicem sparse pubescentes 4 mm. longae 2.8 mm. latae. Carina 4.5–5 mm. longa. Petala superiora oblique obovato-oblonga sparsissime pubescentia ad basin ciliolata quam carina tertiam partem breviora purpurea. Capsula elliptica ad basin paullulo latior sparse ciliolata 5.5 mm. longa 3.2 mm. lata. Semen pilosum 5 mm. longum oblongo-obovoideum. Arillus minimus sparsissime pubescens pallioliformis angustissime scarioso-marginatus integer, umbone subglabro. — Zacatecas: near Conception del Oro, 11–14 Aug. 1904, *Palmer* 255 p. p. (type: K).

27. P. **intricata,** sp. nov. Fruticulosa caulibus pluribus ramosis flexuosis intricate adscendentibus ad 1 dm. longis dense canescenter incurvo-puberulis. Folia media et superiora linearia vel

lineari-lanceolata saepe plicata vel involuta utrimque obtusiuscula 1-nervia subcanescenter incurvo-puberula subsessilia 11–14 mm. longa 1.5–2.5 mm. lata; infima oblonga obtusa 3 mm. longa 1.5 mm. lata. Racemi flexuosi 9–12-flori 2.5–4.5 cm. longi. Flores 3.5–4.5 mm. longi. Sepala oblongo-ovata lanceolata subacuminata sparse ciliolata ceterum glabra 2.5 mm. longa. Alae obovatae apice rotundatae sparse ciliolatae et basi sparsissime incurvo-puberulae ceterum glabrae 3.5–4 mm. longae 1.8 mm. latae. Carina purpurascens glabra 4–4.2 mm. longa. Petala superiora oblongo-spathulata breviora. Capsula elliptica infra medium paullo latior glaberrima (margine ciliolato excepto), vallecula parva saepe fere occulta, 5.7–6.5 mm. longa 4.5 mm. lata, in pedicello incurvo-puberulo patente vel reflexo 2.5 mm. longo. Semen 4 mm. longum subsericeo-pilosum. Arillus minimus 0.7–0.8 mm. altus, umbone corneo dense patenter pilosulo (ca. 0.5 mm. alto), margine scarioso angusto subintegro, lobo dorsali deficiente. — COAHUILA: Saltillo, May 1898, *Palmer* 165 1/2 (TYPE: G). — T. 1. FIG. 13.

27.1. P. **rectipilis,** sp. nov. E basi fruticulosa herbacea erecta pluricaulis 1.6–2.3 dm. alta. Caules infra sparse ramosi flexuosi dense breviter pilosi pilis omnibus recte patentibus. Folia inferiora oblonga vel oblongo-ovalia apice obtusa mucronulata 3-nervia 8–14 mm. longa 1.5–4 mm. lata, ut media et superiora dense breviter patenti-pilosa; media et superiora linearia mucronata 12–22 mm. longa 1.7–2.6 mm. lata, in petiolis patenti-pilosulis ca. 0.5 mm. longis. Racemi terminales vel quasi extra-axillares flexuosi dense patenti-pilosuli 4–10 cm. longi 4–18-flori. Flores 5–5.3 mm. longi. Sepala lanceolata acuta vel subacuminata sparse patenti-pilosula et -ciliolata 2 mm. longa. Alae obovato-ovales apice subacutae breviter unguiculatae patenter ciliolatae et in costa sparse patenti-pilosulae 4.5 mm. longae 2.8 mm. latae. Carina purpurea (apice flavescente excepto) 4.8–5.3 mm. longa. Capsula ovalis basi rotundata glaberrima (margine patenti-pilosulo excepto) 7.5–8 mm. longa 5 mm. lata, vallecula saepe occulta. Semen breviter sericeum 4 mm. longum. Arillus 1 mm. altus, margine scarioso angusto vix lobato. — NEW MEXICO: limestone hills, alt. 1065 m., 3.2 km. south of Hillsboro, Sierra Co., 6 Sept. 1904, *Metcalfe* 1274 (TYPE COLL.: BG). — T.1. Fig. 14.

28. P. PALMERI Wats. Stems several, erect or ascending from a fruticulose base, branched, 1.2–1.8 dm. high, densely subcanes-

cently pubescent with spreading-incurved hairs. Leaves from oval below to oblong or obovate-oblong, obtuse or truncate at the mucronate apex, cuneate at base, 3-nerved, thick, more or less densely pubescent with spreading-incurved hairs, the lower 11 mm. long, 4–5.3 mm. wide, the middle and upper 15–16 mm. long, 4.5–7 mm. wide, on petioles 0.6 mm. long, or subsessile. Racemes 3.5–4.5 cm. long, somewhat flexuose, densely canescently pubescent with spreading-incurved hairs, 6–11-flowered. Flowers 5.7–6 mm. long, " pale greenish yellow." Sepals lanceolate, acuminate, pubescent like the leaves, 2.8 mm. long. Wings obovate, acutish, pubescent nearly all over with spreading-incurved hairs, 5.7–6 mm. long, 2.8 mm. wide. Keel glabrous, equalling the wings. Upper petals with cuneate-obovate somewhat erose apex, " purplish," 4.5 mm. long. Capsule elliptic-ovate, somewhat narrowed above, rounded at base, glabrous except for the subspreading-ciliolate margin, 10 mm. long, 7.5 mm. wide, on a stipe 1 mm. long. Seed 6 mm. long, subsparsely pilose. Aril 1.5 mm. deep, with spreading-pilose umbo and much narrower subentire scarious margin extended into short anterior and dorsal subhorizontal lobes. — Wats.! Proc. Am. Acad. xvii. 325 (1882). — Coahuila: Juarez, 160 km. north of Monclova, Sept. 1880, *Palmer* (type: G). — T. 1. Fig. 15. — Omitted from Chodat's revision.

29. P. **racemosa,** sp. nov. Pluricaulis e basi fruticulosa, caulibus ramosis vel subsimplicibus adscendentibus 2.5–3.5 dm. altis dense incurvo-puberulis sed viridibus. Folia media et superiora linearia acuta mucronulata saepius plus minusve involuta incurvo-puberula 1.5–3.1 cm. longa 1.5–3 mm. lata, inferiora similia sed valde reducta. Racemi caules et ramos terminantes recti vel plus minusve flexuosi 16–21-flori 7–13 cm. longi. Flores 4.5–4.8 mm. longi ut videtur viridescentes. Sepala lanceolata subacuminata patenter incurvo-pilosula 2–2.3 mm. longa. Alae ovali-obovatae apice rotundatae supra et costam secundum infra subdense puberulae pilis patenti-incurvis et ciliolatae 4.5 mm. longae 2.9 mm. latae. Carina alas subaequans. Capsula elliptica basi rotundata substipata in margine ciliolata ceterum glaberrima 7–9.5 mm. longa 5.8–7 mm. lata. Semen breviter pilosum 4.5 mm. longum. Arillus parvus 0.7–1 mm. altus, margine scarioso angusto subintegro lobis lateralibus subnullis dorsali brevissimo. — Chihuahua: Santa Eulalia Mts., 3 Oct. 1885, *Pringle* 572 (type: G). Also in Arizona:

limestone rocks near Tucson, Santa Catalina Mts., 1881, *Lemmon* 498 (G). — T. 1. Fig. 16.

30. P. **longa,** sp. nov. Suffruticulosa erecta pluricaulis 2–4.5 dm. alta. Caules simplices vel sparse ramosi ut axes racemorum et pedicelli dense griseo-incurvo-puberuli. Folia inferiora oblonga vel oblongo-ovalia utrimque obtusiuscula mucronata puberula pilis incurvis 1.1–1.7 cm. longa 4.5–8 mm. lata; media et superiora oblongo-lanceolata vel -lineara acuta vel acuminata interdum obtusa mucronata griseo-puberula pilis subincurvis brevissime petiolata paullum nervosa 1.7–3.6 cm. longa 1.5–4 mm. lata. Racemi laxiflori 3–10.5 cm. longi. Sepala lanceolata pubescentia 3–3.5 mm. longa. Alae ovales vel suborbiculares apice rotundatae subsparse pubescentes 4.8–5.5 mm. longae 2.6–4 mm. latae. Carina purpurea glabra 5–5.7 mm. longa. Petala superiora oblique oblonga 3.6 mm. longa. Capsula ciliolata elliptica emarginata 8 mm. longa 6–7 mm. lata. Semen 4–4.5 mm. longum pilosum. Arillus 1 mm. altus (margine dorsali 1.5 mm. longo), umbone piloso 0.4 mm. alto, margine scarioso valde lobulato ad 0.6 mm. alto in lobos duos laterales et unum dorsalem longiorem horizontalem subdistincte diviso. — *P. puberula* Gray! Pl. Wright. ii. 30 (1853), not i. 41 (1852). — Chihuahua: *Potts* (BK). Also Texas: stony ridges, and in the alluvium at their base, on the Pecos R., May 1852, *Wright* 936 p. p. (type coll.: GK); without locality, *Mexican Boundary Survey under Emory* 189 (K). — T. 1. Fig. 17.

The Kew specimens of *Wright* 936 are mixed with specimens of *P. hemipterocarpa* Gray. The species has been confused with *P. obscura*.

31. P. **retifolia,** sp. nov. Caules 2–3 e basi fruticulosa erecti simplices vel supra sparse ramosi ad 4 dm. alti dense pubescentes pilis aliis brevioribus incurvis aliis longioribus rectis patentibus. Folia media et superiora linearia vel lineari-lanceolata acuminata mucronulata basi acuminata ad rotundata-cuneata sicut caules pubescentia reticulato-nervosa (nervis lateralibus validioribus ca. 5-jugis) 2.6–4 cm. longa 1.8–4 mm. lata, in petiolis 1 mm. longis vel brevioribus; infima valde reducta 4–11 mm. longa. Racemi caules et ramos terminantes 8–14 cm. longi 20–30-flori sicut caules et pedicelli (3–4 mm. longi) pubescentes. Flores 5–6 mm. longi ut videtur viridescentes. Sepala ovata vel ovato-lanceolata acuta vel acuminata ut caules pubescentes 2.5 mm. longa. Alae obovato-

ovales apice rotundatae basi vix unguiculatae sparse ciliatae et costam secundum et apicem et marginem versus pubescentes pilis adscendentibus 5–6 mm. longae 3–3.3 mm. latae. Carina glabra alas aequans. Petala superiora oblonga apice parum dilatata. Ovarium dense pilosum. Fructus deest. — JALISCO: Rio Blanco, Sept. 1886, *Palmer* 735 (TYPE: G).

32. P. OBSCURA Benth. Many-stemmed from a suffruticulose base, erect, 1.2–3.8 dm. high. Stems and inflorescence grayish-puberulous with incurved or rarely partly subspreading hairs. Lower leaves oblong or oval-oblong, obtuse, mucronulate, with 1–2 pairs of lateral nerves, not reticulate, densely puberulous with incurved hairs or subglabrate, very shortly petioled, 1.2–2.8 cm. long, 4–7 mm. wide; middle and upper oblong or even oval-ovate to lanceolate or linear, obtuse to acute or acuminate, mucronulate, densely or sparsely puberulous with incurved hairs, 1.8–4.2 cm. long, 1.5–12 mm. wide. Racemes loosely flowered, 3.3–9 cm. long. Flowers purplish. Sepals lanceolate, acute, pubescent. Alae oval-obovate or elliptic, rounded at apex, sparsely pubescent along middle and toward apex, 4.5–6.5 mm. long, 2–4.5 mm. wide. Keel nearly glabrous, 4.8–6.5 mm. long. Staminal tube sparsely pilose. Upper petals obovate-oblong, sparsely pubescent, 3.5 mm. long. Capsule elliptic, slightly emarginate, when young (ovary) usually densely puberulous, in age glabrate and ciliate, or sparsely or densely puberulous on sides, 8–10 mm. long, 6–8 mm. wide. Seeds pilose, 4–4.8 mm. long. Aril 1.3–3 mm. long, veil-like, appressed, with broad irregularly lobulate scarious margin and pubescent umbo, but without distinct dorsal and lateral lobes. — Divisible into two varieties.

Var. **genuina.** Alae 4.5–5.5 mm. longae 2–3 mm. latae. Carina 4.8–5 mm. longa. Capsula 8 mm. longa 6 mm. lata. — *P. obscura* Benth.! Pl. Hartw. 58 (1840); Chod. Monog. ii. 20. t. 13. f. 31–32 (1893). *P. puberula* Gray! Pl. Wright. i. 40 (1852); not of Chod. l. c. 22. t. 14. f. 1–3 (1893); Rob. in Gray, Syn. Fl. i. pt. i. 450 (1897), in part. — CHIHUAHUA: hills near Cusihuiriachic, 30 Aug. 1887, *Pringle* 1506 (G). DURANGO: near City of Durango, 1896, *Palmer* 627 (G). OAXACA: *Jurgensen* 474 (K); Hacienda del Carmen, 1839, *Hartweg* 446 (TYPE of *P. obscura*: BK); rocks, Misteca Alta, 2135–2440 m., 1840, *Galeotti* 883 (K). Also TEXAS: valley of the Limpia, 1849, *Wright* 104 (TYPE of *P. puberula*: BGK);

Wright 72 (K). New Mexico: Silver City, 1880, *Greene* p. p. (K). Arizona: Chiricahua Mts., *Blumer* 1337 (G); Huachuca Mts., *Goodding* 791 (G). — T. 1. Fig. 18.

Var. **euryptera.** Alae 6–6.5 mm. longae 4–4.5 mm. latae. Carina 6–6.5 mm. longa. Capsula 10 mm. longa 8 mm. lata. — Oaxaca: Zacatlan Mts., 18 June 1894, *L. C. Smith* 31 (G); Monte Alban near Oaxaca, 1770 m., 20 July 1894, *L. C. Smith* 80 (type: G); Cerro de San Felipe, 1750 m., 24 May 1896, *Conzatti* 205 (G); Cerro de San Felipe, 1800 m., 10 June 1897, *Conzatti & González* 335 (G). — Rather different in appearance from normal var. *genuina*, having generally broader stem-leaves than are usual in that variety, but with similar seed and without obvious differential characters beyond the size of the flowers. — T. 1. Fig. 19.

Most of the species of this group have at one time or another been confused with this species, which is at once distinguishable by its peculiar aril. After careful comparison of the type numbers of *P. obscura* and *P. puberula* in Kew Herbarium, I have been forced to the conclusion that they are identical. None of the differences depended on by Dr. Gray in separating *P. puberula* appears to be of any real consequence. The species seems to be the most variable of this section in regard to the pubescence of the capsule, which in the ovary stage is usually but by no means always rather densely puberulous, and in age varies from quite glabrous (except the marginal cilia) to rather closely puberulous, but almost invariably shows at least a few hairs along the septum. The flowers are described in the Synoptical Flora as "yellowish or greenish-white (rarely 'blue')," but in unfaded material are certainly purplish or violet.

32.1. P. **orthotricha,** sp. nov. Suffruticulosa pluricaulis erecta 1.5–2 dm. alta. Caules sparse ramosi ut inflorescentia pedicellique dense pilosuli pilis brevibus late patentibus rectis. Folia inferiora ovalia ad oblongo-ovalia acutiuscula mucronulata basi cuneata 1-nervia plus minusve pubescentia et ciliata pilis brevibus rectis patentibus 5–11 mm. longa 2–4 mm. lata brevissime petiolata; media et superiora oblonga vel lanceolata vel linearia utrimque acuta 1-nervia (nervis lateralibus obscuris vel 1–2-jugis) plus minusve dense pubescentia pilis brevibus late patentibus 1.7–3.5 cm. longa 2–6 mm. lata brevissime petiolata petiolis patenter hispidulo-pilosulis. Racemi laxe pauciflori 2–4.5 cm. longa. Flores

violacei. Sepala lanceolata acuminata sparse patenti-pilosula 2.8 mm. longa. Alae ovales basi breviter unguiculatae ciliolatae medio dorsi sparsissime puberulae 4.8–5 mm. longae 3 mm. latae. Carina 5 mm. longa. Petala superiora obovata 4 mm. longa. Capsula oblongo-elliptica apicem versus paullulum angustata emarginata subsparse et brevissime patenti-puberula et ciliolata 10 mm. longa 6.5 mm. lata. Semen 4.7 mm. longum pilosum. Arillus 2.4 mm. altus palliiformis margine lato scarioso lobulato in lobos laterales et dorsalem non diviso. — ARIZONA: foothills of the Santa Rita Mts., April–July 1884, *Pringle* p. p. (TYPE: K).

33. P. OAXACANA Chod. Stems few, woody at base, from a woody root, simple or slightly branched at base, barely puberulous above, about 2 dm. long. Leaves linear, acute at base and apex, mucronate, glabrescent, the larger 26–35 mm. long, 2.5–3 mm. broad. Racemes 3–5-flowered, 3 cm. long, the rachis curved; pedicels 4–4.5 mm. long. Flowers 6–7 mm. long. Sepals lanceolate, ciliate, many-nerved, the upper 1/3 longer. Keel somewhat 3-lobed, the limb noticeably shorter than the claw. Wings elliptic, slightly oblique at base, short-clawed, ciliate, reticulate-nerved, a little longer than broad. Upper petals sublinear, somewhat constricted above the middle, subacute. Filaments long-hirsute. Ovary obovate, shortly and densely pilose. — Chod. Bot. Jahrb. lii. Beibl. 115. 73 (193), as *P. oaxacanum*. — Based by Chodat on *Seler* 86, from San Juan del Estado, Etla, Oaxaca. Not seen; description compiled.

34. P. LOZANI Rose. E basi fruticulosa pluricaulis caulibus infra ramosis ad 1 dm. altis ut ramis curvato-adscendentibus subcanescentibus pilis densis incurvis. Folia caulina inferiora ovalia mucronata utrimque rotundata subsparse incurvo-pubescentia 11 mm. longa 6 mm. lata vel minora, superiora oblonga vel anguste oblonga mucronata utrimque acutiuscula 10–13 mm. longa 1.8–3.5 mm. lata, ea ramorum similia sed minora. Racemi breves 1–1.5 cm. longi 3–4-flori. Flores luteo-viridescentes. Bracteae minutae subulatae persistentes. Sepala lanceolata acuminata incurvo-puberula 3–3.5 mm. longa, superius longius subpersistens. Alae ovales abrupte acutae basi cuneatae ad apicem sparse incurvo-puberulae 5–5.5 mm. longae 2.5–3.5 mm. latae. Carina alas subaequans. Capsula ovalis vallecula angusta juventate subsparse incurvo-pubescens maturitate ciliolata in lateribus sparsissime pubescens

vel etiam glabrata 7.5–9 mm. longa 5.7–6 mm. lata. Semen dense subsericeo-pilosum 4.5 mm. longum. Arillus 1.7 mm. altus, umbone ad 0.7 mm. alto, margine scarioso subappresso irregulariter lobulato lobo dorsali vix indicato. — Rose! Contr. U. S. Nat. Herb. xiii. 307 (1911). *P. calcicola* Rose! l. c. x. 122. t. 37 (1906), not Chod. Monog. ii. 326 (1893). — Puebla: La Cañada, near Tehuacan, 7 Aug. 1897, *Pringle* 7477 (type coll.: G). — T. 1. Fig. 20.

35. P. **brachyanthema,** sp. nov. Pluricaulis e basi fruticulosa 1.7–3.3 dm. alta. Caules sparse ramosi ramis erectis patenter incurvo-pubescentes virides. Folia infima obovata mucronata 3–7 mm. longa 1.5–4 mm. lata; media et superiora oblongo-elliptica subobtusa valde mucronata basi cuneata trinervia sparse incurvo-patenti-pubescentia 10–15 mm. longa 3–4.8 mm. lata in petiolis 1 mm. longis. Racemi terminales et quasi extra-axillares subrecti vel parum flexuosi 12–22-flori 5–8.5 cm. longi. Flores 4.5–5 mm. longi. Sepala lanceolato-ovata acuminata subpatenti-pilosula 2.5–3 mm. longa. Alae ovales obtusae vel subacutae vix unguiculatae viridescentes subpatenti-pilosulae et ciliolatae 4.5–5 mm. longae 2.3–2.5 mm. latae. Carina apice flavida ceterum purpurascens glabra alas aequans. Petala superiora oblongo-spathulata apice purpurascentia. Ovarium ciliatum. Capsula elliptica emarginata basi rotundata glaberrima (margine ciliolato excepto) 7–7.7 mm. longum 5.5–6 mm. latum. Semen (submaturum) breviter pilosum 3.5 mm. longum. Arillus 1 mm. altus, umbone ad 0.5 mm. alto, margine scarioso irregulariter crenato-lobulato in lobum brevem dorsalem horizontalem producto (margine dorsali 1.6 mm. longo). — San Luis Potosi: Minas de San Rafael, May 1911, *Purpus* 5169 (type coll.: BG). — T. 1. Fig. 21.

36. P. **oophylla,** sp. nov. Caules pauci e basi fruticulosa erecti vel suberecti ramosi 2 dm. alti et ultra dense pubescentes pilis patenti-incurvis. Folia infima elliptica vel elliptico-obovata 3.5–4 mm. longa 2.8–3 mm. lata; media et superiora ovata acuta vel subacuta mucronata basi rotundata pubescentia pilis incurvis (eorum in pagina superiore basibus subtuberculatis) 11–22 mm. longa 3.5–10 mm. lata, in petiolis 1–1.5 mm. longis. Racemi 9–30-flori 4–7 cm. longi et ultra. Flores 6.5 mm. longi. Sepala oblongo-ovata acuta sparse incurvo-patenti-pubescentia 2.3–2.5 mm. longa. Alae orbiculari-ovales rotundatae basi breviter unguiculatae ubique vel solummodo apicem versus incurvo-patenti-pubescentes purpu-

rascentes 6–6.5 mm. longae 4–4.8 mm. latae. Carina alas aequans. Petala superiora apice parum dilatata 6 mm. longa. Capsula elliptica immaturitate sparse incurvo-pubescens maturitate glabra (margine ciliato excepto) 6.5–7 mm. longa 5–5.5 mm. lata. Semen subsericeo-pilosum 4.5 mm. longum. Arillus 1.6 mm. altus, in margine dorsali 2 mm. longus, umbone 0.5 mm. alto, margine scarioso ad 1.1 mm. alto irregulariter lobulato in lobos non diviso. — Puebla: Tlacuilotepec, June 1909, *Purpus* 3921 (type coll.: BG). — Distributed as *P. obscura* Benth. — T. 1. Fig. 22.

37. P. Brandegeeana Chod. Many-stemmed from a thick woody base, the stems branched, erectish, 7–9 cm. high, pubescent with incurved-ascending hairs. Leaves below much reduced, obovate, 2.5–3 mm. long, 1–1.5 mm. wide; middle and upper oblong to oval or oblong-linear, acute to obtuse, scarcely mucronulate, cuneate-rounded at base, thickish, subglabrous but lepidote above, sparsely incurved-pubescent beneath, 6–10 mm. long, 1.5–4.5 mm. wide, on petioles about 0.5 mm. long. Racemes very short, pseudolateral, 1–3-flowered; bracts subulate, rather persistent. Flowers greenish, 4–4.5 mm. long. Sepals lanceolate to ovate-lanceolate, acuminate, sparsely incurved-pubescent to subglabrate, 2.3–2.7 mm. long, the upper subpersistent. Wings oval, rounded at apex, unguiculate at base, ciliolate above, sparsely incurved-pubescent along costa, 4.5 mm. long, 2.5–2.8 mm. wide. Carina glabrous, greenish, 4 mm. long. Upper petals purplish toward apex, 3.5 mm. long. Capsule elliptic, emarginate, at submaturity with a few hairs on side, at maturity glabrous except for the ciliate margin, 7.5–8.5 mm. long, 6–6.5 mm. wide. Seed silky-pilose, 4 mm. long. Aril 1.5 mm. deep, 2.3 mm. long on back; umbo 0.6 mm. deep; scarious margin irregularly lobulate, with indistinct lateral and distinct dorsal lobe descending at an angle of about 45°. — Chod.! Bot. Jahrb. lii. Beibl. 115. 72 (1914), as *P. Brandegeeanum*. — Puebla: dry places, El Riego, Tehuacan, July 1905, *Purpus* 1429 (type coll.: BG). Hidalgo: Zimapan, *Coulter* 728 p. p. (K), 729 p. p. (K). — T. 1. Fig. 23.

38. P. compacta Rose. Suffruticulose, many-stemmed, the stems subsimple or branched, ascending, 9–21 cm. high, usually densely leafy, like the inflorescence griseous-puberulous with incurved hairs. Lower leaves obovate to oval or oval-oblong, obtuse, mucronulate, cuneate at base, 1-nerved, the lateral nerves

none or 1–2 pairs, densely or subsparsely puberulous with incurved hairs, 5–17 mm. long, 2.5–8 mm. wide; middle and upper oblong or lance-oblong, obtuse to acutish, 1.1–1.9 cm. long, 3–5 mm. wide, on petioles 1 mm. long. Racemes rather densely flowered, 1.5–4 cm. long. Flowers apparently ochroleucous. Sepals lanceolate, pilosulous. Wings oval or obovate-oval, obtuse or abruptly short-pointed, puberulous, 3.5–5 mm. long, 2–2.5 mm. wide. Keel 4–4.5 mm. long. Upper petals narrowly obovate, 3.2 mm. long. Capsule elliptic, emarginate, sparsely or densely incurved-puberulous, 7–7.5 mm. long, 5–7 mm. broad. Seed pilose, 3.5–4.6 mm. long. Aril 1–2 mm. long, distinctly 3-lobed, the lobes scarious, linear or linear-lanceolate, entire or slightly lobulate, descending or the dorsal more or less spreading, subequal or the dorsal somewhat the longer. — Rose! Contr. U. S. Nat. Herb. viii. 315 (1905). *P. pubescens* Gray! ex Chod. Monog. ii. 21. t. 13. f. 33–37 (1893); not Mart. Denkschr. Bot. Ges. Regensb. i. 185 (1815). — San Luis Potosi: San Miguelita Mts., Aug. 1877, *Schaffner* 8 (GK); 1878, *Parry & Palmer* 42 1/2 (cotype coll. of *P. pubescens*: GK). Hidalgo: calcareous soil near Tula, 2075 m., 17 July 1896, *Pringle* 6363 (BGK); rocks on mountains, Ixmiquilpan, Sept. 1905, *Purpus* 1428 (G). Jalisco: base of Nevada de Colima, 22 May 1893, *Pringle* 5507 (G). Puebla: Tlacuiloltepec, 1830–2135 m., Aug. 1909, *Purpus* 3920 (G). Mexico: Mt. Zocoalco near Guadalupe, 10 July, *Bourgeau* 477 (K); Valley of Mexico, *Schaffner* (K); *Schaffner* 34 (G); lava fields, 2290 m., Valley of Mexico, 25 Aug. 1896, *Pringle* 6425 (type coll. of *P. compacta*: BGK). Mexico without locality: 1856, *Schmitz* (B). — T. 1. Fig. 24.

It has seemed best to adopt for this plant the name above used in place of the name *P. pubescens* Gray, most unfortunately dragged forth from its herbarium obscurity by Chodat. *P. pubescens* Mart., not mentioned by Chodat, was described without locality in connection with three other new species of India, and as a MSS. synonym of Rottler's is cited for this as for the other three species it is safe to assume that it also is an Indian species. Accordingly its confident identification with *P. violacea* Aubl. of Guiana by the Index Kewensis is clearly erroneous, as is confirmed by Martius's description. In the lack of any definite disposition to synonymy of Martius's species, it is certainly inadvisable to use the same name for the Mexican plant here described. This binomial (*P.*

pubescens) has also been used by Muhlenberg, Nuttall, and Schlechtendal, but in none of these cases for a valid species.

38.1. P. **tenuiloba,** sp. nov. Suffruticulosa erectiuscula pluricaulis 13.5–21.5 cm. alta. Caules sparse ramosi ut inflorescentia griseo-incurvo-puberuli. Folia inferiora oblonga obtusiuscula mucronata nervis lateralibus 1-jugis sparse appresse puberula 8–14 mm. longa 3–3.5 mm. lata brevissime petiolata; media et superiora lanceolata vel lineari-lanceolata acuta involuta subdense puberula pilis incurvis 1.7–2.5 cm. longa 2.5–4 mm. lata. Racemi laxissime pauciflori 2–3.8 cm. longi. Sepala ovato-lanceolata vel lanceolata acuta pubescentia 2.2 mm. longa. Alae ovales apice rotundatae sparse pubescentes 3.5 mm. longae 2.4 mm. latae. Carina glabra 4 mm. longa. Petala superiora obovata 3 mm. longa. Capsula sparse ciliolata ovalis vix emarginata 7 mm. longa 4 mm. lata. Semen anguste oblongo-obovoideum pilosum 4 mm. longum. Arillus trilobus umbone corneo pilosulo, lobo dorsali lanceolato acuto scarioso descendente 1.3 mm. longo, lobis lateralibus 1 mm. longis. — Arizona: foothills of the Santa Rita Mts., April–July 1884, *Pringle* p. p. (type: K).

The type collection, distributed as *P. puberula*, includes also the type of the very distinct spreading-pilosulous *P. orthotricha* (no. 32.1). Their occurrence in extreme southern Arizona makes their subsequent discovery in Mexico a matter of great probability.

39. P. polymorpha Chod. Stems few from a perennial base, slender, appressed-pubescent, 1–2 dm. long. Leaves varied, from ovate or lance-oblong to linear-lanceolate or linear, mucronate, sparsely minutely appressed-puberulous, paler beneath, thin or chartaceous, 2–3.5 cm. long, 3–17 mm. wide. Racemes terminal, few-flowered; pedicels 2.5–5 mm. long. Flowers 6–7 mm. long. Sepals lance-linear, acute, pubescent. Wings glabrous, oblong-elliptic, scarcely unguiculate at base. Upper petals shorter than the elongate keel, with scarcely dilated obtuse or subspatulate limb. Filaments slightly ciliate at base. Capsule oblong, with broadish sinus, hirsute, cuneate at base, 9 mm. long, 5 mm. wide. Seed pyriform, hirsute. Aril capitelliform, with two slender descending lateral lobes a third as long as the seed, and a prolonged twisted dorsal lobe. — Chod. Bot. Jahrb. lii. Beibl. 115. 74 (1914), as *P. polymorphum*. — Based by Chodat on *Seler* 3130 from lime-

stone hills of Chaculá, Huehuetenango, Guatemala. — Not seen; description compiled.

Subsect. B. **Hebantha,** subsect. nov.[1] Folia saepius majuscula submonomorphia, saepius ovata acuta ad acuminata rare obtusa, infima interdum reducta sed quam superiora rarissime latiora. Arilli umbo saepius minimus. Species typica *P. hebantha* Benth.

a. Capsule merely ciliate at maturity, *b.*
  b. Leaves densely subvelutinous beneath (Santa Lucia and Santo Domingo) ..... 40. *P. sancta-luciae.*
  b. Leaves not subvelutinous beneath (Mexico and Central America), *c.*
    c. Pubescence fine, the hairs appressed or strongly incurved, *d.*
      d. Stem and leaves sparsely strigillose; leaves narrowly lanceolate (5.4–6.5 cm. long, 9–14 mm. wide) ... 43. *P. longipes.*
      d. Stem and leaves usually densely strigillose or incurved-puberulous; leaves broader in proportion, *e.*
        e. Flowers 9 mm. long or more ..... 67. *P. Seleri.*
        e. Flowers 6–7 mm. long, *f.*
          f. Leaves and upper part of stem pale, glaucescent; aril with narrower scarious border (see fig. 38) ..... 45. *P. appressipilis.*
          f. Leaves and stem green; aril with broader scarious border (see fig. 27) ..... 46. *P. velata.*
    c. Pubescence (at least in part) of longer spreading hairs, *g.*
      g. Dorsal margin of aril horizontally spreading, *h.*
        h. Wings ciliate; capsule narrowed at base; dorsal margin of aril 2.8 mm. long ..... 47. *P. Galeottii.*
        h. Wings nearly glabrous; capsule broad at base; dorsal margin of aril 2 mm. long ..... 50. *P. jaliscana.*
      g. Dorsal margin of aril descending at an angle of about 45° ..... 48. *P. rivinaefolia.*
      49. *P. Albowiana.*

a. Capsule more or less pubescent on sides at maturity, *i.*
  i. Wings broadly oval or orbicular-oval, less than twice as long as wide, *j.*
    j. Capsule deltoid-quadrate, distinctly narrowed from near base toward apex; aril 1 mm. deep ..... 52. *P. pedicellata.*
    j. Capsule elliptic, not narrowed from base to apex; aril deeper, *k.*
      k. Aril horizontal, crenate-dentate, the dorsal lobe prolonged, the lateral lobes obsolete (Martinique) . 41. *P. antillensis.*
      k. Aril otherwise (Mexico and Central America), *l.*
        l. Keel 3.2–3.5 mm. long; capsule narrowed toward base, with rather broad vallecula ..... 55. *P. brachytropis.*
        l. Keel 4.2–6.8 mm. long, *m.*
          m. Wings rather densely pubescent over whole outer surface ..... 56. *P. americana.*
          m. Wings sparsely pubescent along costa and base, or subglabrous, *n.*
            n. Stem without long spreading hairs, *o.*

[1] *P. serpens* (no. 19) and *P. Conzattii* (no. 21) might be sought here.

o. Dorsal margin of aril suberect.....59. *P. consobrina.*
o. Dorsal margin of aril not suberect, *p*.
p. Capsule spreading-pilosulous on sides, 53. *P. cuspidulata.*
p. Capsule sparsely incurved- or appressed-puberulous on sides, *q*.
q. Leaves glaucescent beneath; wings 6.5–7 mm. long.....45. *P. appressipilis.*
q. Leaves not glaucescent beneath; wings 5.5 mm. long.....54. *P. microtricha.*
n. Stem-pubescence including longer spreading hairs, *r*.
r. Lower sepals 1–1.4 mm. long.....51. *P. brachysepala.*
r. Lower sepals (1.5) 2–3 mm. long, *s*.
s. Spreading hairs of stem rather short, very numerous.....42. *P. amphothrix.*
s. Spreading hairs of stem longer, comparatively few, *t*.
t. Aril with comparatively large umbo. 49. *P. Albowiana.*
t. Aril with minute umbo, *u*.
u. Dorsal margin of aril descending at an angle of about 45°.....58. *P. Hayesii.*
u. Dorsal margin of aril horizontal; aril 1.5 mm. deep; leaves lanceolate.....44. *P. chiapensis.*
u. Dorsal margin of aril obliquely erectish; aril 2.3–3.8 mm. deep; leaves broadly ovate.....59. *P. consobrina.*
i. Wings oblong, oblong-oval, or obovate-oblong, 2–4 times as long as wide, *v*.
v. Stem-pubescence of short appressed or incurved hairs only, *w*.
w. Wings 8–9.5 mm. long, *x*.
x. Leaves glabrescent.....67. *P. Seleri.*
x. Leaves rather densely incurved-puberulous beneath.66. *P. isotricha.*
w. Wings 5.5 mm. long or less.....59. *P. consobrina.*
v. Stem-pubescence including longer spreading hairs, *y*.
y. Wings very narrowly oblong (1.2–1.8 mm. wide), pubescent nearly all over outside with rather long spreading hairs.....57. *P. hebantha.*
y. Wings broader, pubescent merely on costa or also toward apex with shorter more or less incurved hairs (longer and more numerous in *P. panamensis*), *z*.
z. Wings 6.5 mm. long or less, *aa*.
aa. Seed glabrous; aril rather closely investing seed, with short horizontal dorsal lobe....60. *P. guatemalensis.*
aa. Seed pubescent; aril much larger, casque-shaped, with obliquely erectish dorsal lobe, *bb*.
bb. Aril finely crenate or subentire.....61. *P. Durandi.*
bb. Aril more or less dentate-lobulate.....59. *P. consobrina.*
z. Wings 7–10 mm. long, *cc*.
cc. Leaves with numerous long straight spreading hairs on veins beneath, *dd*.
dd. Aril 3 mm. deep, with obliquely erectish dorsal lobe (Panama).....65. *P. panamensis.*
dd. Aril 2 mm. deep, with nearly horizontal dorsal lobe (Vera Cruz).....64. *P. biformipilis.*
cc. Leaves with hairs of veins beneath nearly all incurved or appressed, *ee*.
ee. Aril strongly lobulate.....63. *P. costaricensis.*
ee. Aril somewhat 4-angled but subentire.....66. *P. isotricha.*

(*P. trichoptera* Chod. (no. 62) has not been inserted in the key, through lack of knowledge of its seed-characters.)

40. P. SANCTA-LUCIAE Chod. Stems woody, fragile, erect, simple or sparsely branched, slightly and very shortly puberulous, 1.5–4 dm. long. Leaves elliptic-lanceolate or lanceolate, acute or apiculate, strongly reticulate both sides and very shortly but densely subgriseous-velutinous, coriaceous, 2–2.5 cm. long, 1–1.1 cm. wide. Flowers 6 mm. long. Wings elliptic, ciliate, subequal to corolla, 6 mm. long, 3.5 mm. wide. Upper petals emarginate. Capsule elliptic, cordate-emarginate, with triangular vallecula, 10 mm. long, 7 mm. wide. Seed pyriform, brown. Aril membranaceous, retrorsely spurred. — Chod. Monog. ii. 36 (1893). — Not seen; based by Chodat on specimens from St. Lucia (*Schwaegrichen*, in hb. Monac.) and from St. Domingo.

41. P. ANTILLENSIS Chod. Suffruticose, the stems erect, sparsely short-branched at apex, crisply puberulous above, 5 dm. long. Leaves ovate-lanceolate, acuminate or subcuspidate, herbaceous, slightly puberulous, on margin shortly ciliate or glabrescent, 2–7 cm. long, 0.8–2.5 cm. wide, on petioles 2.5–3 mm. long. Flowers 7 mm. long. Wings ovate-elliptic, inequilateral, equalling corolla, rounded at apex, shortly unguiculate at base, reticulate, sparsely pubescent above, ciliate. Upper petals 1/3 shorter than keel, slightly dilated at apex, subacute. Filaments glabrous. Capsule elliptic, strongly emarginate, sparsely subhirsute, slightly narrowed toward base, 13 mm. long, 9 mm. wide. Seed pyriform, sparsely hirsute. Aril papery, sub-3-lobed, the margin crenate-dentate; anterior lobes acute, obliquely projecting; dorsal prolonged, horizontal. — Chod. Monog. ii. 33. t. 14. f. 28–30 (1893). — Not seen; described by Chodat from *Belanger* 621, from near St. Pierre, Martinque.

42. P. **amphothrix,** sp. nov. Caules 1–4 erecti e basi fruticulosa sparse ramosi foliosi 1.1–1.5 dm. alti ut racemi dense pubescentes pilis aliis incurvis brevibus aliis crebris longioribus patentibus rectis. Folia ima valde reducta ovalia vel ovali-obovata obtusa vix mucronulata basi cuneata vel rotundata praecipue ad marginem pubescentia pilis aliis paucis incurvis aliis crebrioribus longioribus patentibus rectis 3.5–11.5 mm. longa 2–4.5 mm. lata; media et superiora multiplo majora oblongo-lanceolata vel ovalia apice obtusa vel subacuta mucronulata basi cuneata reticulato-venosa

(venis lateralibus validioribus 4–6-jugis) ut ima sparse pubescentia valde variabilia 1.5–3.6 cm. longa 4.5–16 mm. lata, in petiolis 1 mm. longis. Racemi terminales et quasi extra-axillares 12–21-flori 4–7.5 cm. longi. Flores 5–5.5 mm. longi in pedicellis 3 mm. longis (eorum pilis maxima ex parte incurvis). Sepala ovato-lanceolata acuminata ciliolata et subpatenter incurvo-pubescentia 2.5 mm. longa. Alae ovales apice rotundatae basi late cuneatae purpurascentes ciliolatae et ad costam sparse puberulae 5–5.5 mm. longae 3–3.5 mm. latae. Carina luteo-virescens alas aequans. Petala superiora oblongo-obovata. Ovarium dense pilosulum. Fructus deest. — DURANGO: Otinapa, 25 July–5 Aug. 1906, *Palmer* 462 (TYPE: G).

43. P. **longipes,** sp. nov. Basis . . . Caulis tenuis minutissime strigillosus supra sparse ramosus 3 dm. altus et ultra. Folia caulina lanceolata longe acuminata apice obtusiuscula valde cuspidata basi cuneata tenuia venis lateralibus 5–6-jugis vix reticulatis supra viridia minute sparse strigillosa demum subglabrata subtus paullo pallidiora ad venas minute strigillosa inter venas subglabra 5.4–6.5 cm. longa 9–14 mm. lata, in petiolis sparse strigillosis 2 mm. longis; folia ramorum linearia 2.5–3.6 cm. longa 1.8–3 mm. lata. Racemus terminalis laxiflorus 14.5 cm. longus, laterales breviores. Flores ut videtur ochroleuci, in pedicellis tenuibus 5–8 mm. longis. Sepala lanceolato-ovata acuta ciliolata et sparse puberula plus minusve patentia 2–2.5 mm. longa, superius longius. Alae oblongo-ovales apice rotundatae basi cuneatae ad apicem ciliolatae costam secundum sparse appresso-puberulae 6.6 mm. longae 3.3 mm. latae. Carina valde unguiculata apice acutiuscula glabra 6.8–7.1 mm. longa. Petala superiora oblonga ad basin ciliata 5.5 mm. longa. Capsula (valde immatura) elliptica ciliata in lateribus glaberrima. — OAXACA: 1842, *Ghiesbreght* (TYPE: K, fragm. G). The type collection was distributed as *P. caracasana* HBK. var.

44. P. **chiapensis,** sp. nov. Basis . . . Caules erecti simplices vel simpliciter ramosi subdense pubescentes (pilis brevibus incurvis vel patenti-incurvis, paucis longioribus patenti-incurvis interdum adjectis) 2.3–2.4 dm. alti. Folia ima ovalia vel obovata obtusa vel acuta valde reducta 6–12 mm. longa 3–4 mm. lata; media et superiora lanceolata acuminata submucronata basi cuneata reticulata (nervis lateralibus 3–4-jugis) sparse incurvo-pubescentia 2–4.2 cm. longa 5–8 mm. lata, in petiolis 1–1.5 mm. longis. Racemi termi-

nales 14–20-flori 6–10 cm. longi. Flores 5–6 mm. longi. Sepala inferiora ovata superius ovato-oblongum acuta incurvo-pubescentia 2–2.3 mm. longa. Alae ovales apice late rotundatae basi oblique subunguiculatae sparse ciliolatae ad costam incurvo-pubescentes 5.5 mm. longae 3.5 mm. latae. Carina 5–6 mm. longa. Petala superiora obovata apice rotundata 5 mm. longa. Capsula elliptica subdense incurvo-puberula 10 mm. longa 6 mm. lata, in pedicello 4 mm. longo. Semen (immaturum) sericeo-pilosum. Arillus maturus papyraceus (umbone minimo) sparse pilosus 1.5 mm. altus irregulariter lobulatus in lobos distinctos non divisus, margine dorsali horizontali 2.2 mm. longo. — CHIAPAS: mountains, temperate region, November (1864–70), *Ghiesbreght* 736 (TYPE: G). — T. 2. FIG. 36. — According to the collector, the flowers are blue.

45. P. **appressipilis,** sp. nov. E basi suffruticulosa erecta pluricaulis ad 3.5 dm. alta subglaucescens. Caules ramosi ut inflorescentia subdense griseo-puberuli pilis incurvis appressis. Folia ovata vel inferiora ovalia acuta vel obtusa cuspidulata basi cuneato-rotundata firma nervis 2–3-jugis prominentibus non reticulatis supra obscure viridia subtus pallida glaucescentia subdense puberula pilis incurvo-appressis inferiora 1.3–1.8 cm. longa 8–10 mm. lata, media et superiora 2–3 cm. longa 9–13 mm. lata; petioli griseo-puberuli 2 mm. longi. Racemi sublaxiflori ad 8 cm. longi. Flores ut videtur ochroleuci. Sepala oblongo-ovata acutiuscula subdense incurvo-puberula 3.8 mm. longa. Alae late ellipticae apice rotundatae basi cuneatae in basi et supra in costa et ad apicem incurvo-puberulae ciliolatae 6.5–7 mm. longae 4.5–5 mm latae. Carina glabra 6.8 mm. longa. Petala superiora oblongo-obovata plus minusve ciliolata 5.8 mm. longa. Capsula juventate ciliata in lateribus glaberrima vel subsparse incurvo-puberula elliptica. Fructus deest. — MORELOS: lava fields above Cuernavaca, 2440 m., 4 June 1904, *Pringle* 11925 (TYPE COLL.: GK). — T. 2. FIG. 38 (immature seed).

46. P. **velata,** sp. nov. Basis . . . Caulis erectus apice simpliciter ramosus ut inflorescentia subdense incurvo-puberulus 3.4 dm. altus et ultra. Folia ovata vel rhomboideo-lanceolata vel -ovata acuminata apice supremo saepius obtusa cuspidata basi acute cuneata ubique sparse incurvo-puberula supra obscure viridia infra paullo pallidiora nervis lateralibus ca. 5-jugis anastomanti-

bus 3.7–5.2 cm. longa 1.1–2.2 mm. lata, in petiolis incurvo-puberulis 1.5–2 mm. longis. Racemi ca. 15–flori 6.5–10.5 cm. longi. Flores 6 mm. longi. Sepala ovata acuta sparse incurvo-puberula et ciliolata 2–2.4 mm. longa. Alae ovales apice rotundatae basi sparse puberulae ceterum glabrae 5.5 mm. longae 3.5 mm. latae. Carina 5.5–6 mm. longa. Capsula late elliptica vel suborbicularis basi rotundata margine ciliato excepto glaberrima 10.5–11.5 mm. longa 9.5–10.8 mm. lata, vallecula clausa. Semen pilosum 5 mm. longum. Arillus 3 mm. altus, margine scarioso palliiformi appresso sparse piloso margine inferiore paucilobulato. — CHIAPAS: temperate region, 1864–70, *Ghiesbreght* 879 (TYPE: G). Flowering in August and September, the flowers "bleues" according to the ticket, but doubtless purplish. Distributed as *P. ovalifolia* DC. — T. 1. FIG. 27.

47. P. GALEOTTII Chod. Stem simple or sparsely branched, slightly hirsute, from a woody base. Leaves lanceolate, attenuate at each end, acute, not cuspidate, ciliate and slightly hirsute-puberulent, paler beneath, the nerves whitish, 2.8–4 cm. long, 1–1.4 cm. wide. Racemes loosely flowered, elongate, the rachis puberulent; pedicels at length spreading, puberulent, 4 mm. long Flowers 6 mm. long. Sepals linear, acute, subequal, ciliate. Wings shorter than corolla, elliptic-obovate, slightly pubescent and ciliate. Upper petals slightly shorter than keel, ligulate, slightly spatulate, rounded at apex. Ovary pilose. Capsule orbicular, emarginate, hirsute-ciliate. Seed thick, clothed with rufous hairs, 4 mm. long. Aril papery, 2 mm. deep, 2.8 mm. long on the dorsal margin, crenate or undulate, scarcely lobed. — Chod. Monog. ii. 28. t. 14. f. 17–20 (1893), as *P. Galleoti.* — Not seen; based by Chodat on *Galeotti* 875 (hb. Brussels) from Rancho de Haupa, between Jalapa and Cordova, Vera Cruz.

48. P. RIVINAEFOLIA HBK. Stems procumbent or erect, simple or branched above, pubescent. Leaves ovate or oblong-ovate, acuminate, acute at base, reticulate, the nerves prominent beneath, membranaceous, puberulous especially above, ciliate, bright green, scarcely paler beneath, about 5 cm. long, 17–20 mm. wide, on pubescent petioles 2.5 mm. long. Racemes terminal and axillary, rather loosely many-flowered, 6.2–7.7 cm. long. Flowers violaceous, about 7 mm. long; pedicels pubescent, 5–6.2 mm. long; bracts lance-subulate, deciduous. Sepals lanceolate, acute, pubes-

cent, the upper longer. Wings elliptic, "glabrous," thrice as long as sepals, equalling corolla. Upper petals obovate, shorter than keel. Capsule elliptic-orbicular, emarginate, membranaceous, ciliate, glabrous on sides. Aril apparently rather small. — HBK. Nov. Gen. v. 409. t. 512 (1821). *P. americana* Mill. *α. normalis* Ktze. Rev. i. 48 (1891), as to synonym. — Not seen; recorded by HBK. from near Ario, alt. 1830 m. — Chodat's description, made from the types (Monog. ii. 24 (1893)) does not agree in all characters with the original. I can discover no feature in the original description to distinguish the species from Chodat's *P. Albowiana*, but am unwilling to unite them without examining the types.

49. P. Albowiana Chod. Suffruticulose, several-stemmed, erect, 3–4 dm. high. Stems subsimple or sparsely branched, rather densely pubescent with short incurved hairs mixed with plentiful longer spreading hairs. Leaves ovate (the lower, not seen, probably oval), acute, cuspidate, at base rounded to cuneate-rounded, thin, with 3–4 pairs of lateral veins, not reticulate, green above, pale beneath, rather densely pubescent both sides with rather long incurved hairs, 2.5–5.6 cm. long, 1.5–3 cm. wide, on petioles 1–2 mm. long, pubescent like the stem. Racemes 1.5–13 cm. long, loosely flowered; pedicels rather sparsely incurved-pubescent, 3.5–5.5 mm. long. Flowers purplish. Sepals ovate or ovate-oblong, acutish, pubescent with incurved hairs, 2–2.5 mm. long. Wings oval, rounded at apex, cuneate at base, very sparsely puberulous along midnerve, somewhat purplish-tinged, 5–6 mm. long, 3–4 mm. wide. Keel glabrous, 6–6.2 mm. long. Upper petals oblong-subovate, ciliate toward base, 5 mm. long. Capsule elliptic, ciliate, pale, reticulate, 1.2 cm. long, 1 cm. wide, in youth sometimes slightly puberulous on the sides; occasionally one cell is abortive and densely appressed-pubescent, while the other is glabrous except for the marginal cilia. Seed pilose, 4.2–4.7 mm. long. Aril 1.5–2 mm. long, cloak-like, with lobulate or slightly lobed margin, rather closely involving the seed. — Chod.! Bull. Herb. Boiss. iii. 123 (1895). — Jalisco: barranca near Guadalajara, 8 Nov. 1888, *Pringle* 2147 (G); cool slopes of barranca near Guadalajara, Sept.–Oct. 1891, *Pringle* 3876 (type coll.: BGK); granitic ledges of barranca of Guadalajara, 1375 m., 28 Sept. 1903, *Pringle* 11375 (GK). Michoacan: granitic soil, El Ocote, 600 m., Dec. 1898, *Langlassé* 722 (G). Morelos: Acapulco, Oct. 1894–Mar. 1895,

Palmer 166 p. p. (G). Mexico without locality: *Pavon* (B). To this species I also refer with doubt specimens in hb. Kew. collected at Acapulco by *Sinclair* and in " Mexico " by *Baites*. *Pringle* 2988 (Guadalajara, 1889: G), in flower and young fruit, may belong here, but shows no long hairs among the short ones of the stem. — T. 1. Fig. 26.

50. P. **jaliscana,** sp. nov. Basis. . . . Caulis erectus sparse ramosus subdense pubescens pilis aliis brevioribus patenti-incurvis aliis paucis longis patentibus rectis, 4 dm. altus et ultra. Folia ovata acuminata cuspidata basi cuneata vel cuneato-rotundata utrinque subdense pubescentia pilis brevioribus patenti-incurvis paucis longioribus subpatentibus intermixtis, venis lateralibus 5–6-jugis anastomantibus, media 3.5–4.2 cm. longa 1.4–2 cm. lata in petiolis 2.5 mm. longis, inferiora et superiora minora. Racemi caulem et ramos terminantes 7.5–15 cm. longi 30–57-flori. Flores 5–5.5 mm. longi. Sepala oblongo- vel lanceolato-ovata acuminata sparse incurvo-puberula et ciliolata 2.5 mm. longa. Alae ovali-obovatae apice rotundatae basi cuneatae basi ima puberulae ceterum glabrae 5.2–5.3 mm. longae 3–3.3 mm. latae. Carina 5–5.5 mm. longa. Petala superiora oblonga apice rotundata vix dilatata. Capsula orbicularis margine ciliato excepto glaberrima basi rotundato-truncata apice emarginata (vallecula aperta 1–1.3 mm. alta) 8.5–9 mm. longa 8.5–9 mm. lata. Semen pilosum 4.3 mm. longum. Arillus 1.5 mm. altus, in margine dorsali 2 mm. longus, umbone parvo dense piloso, margine scarioso lato irregulariter lobulato, margine anteriore verticali dorsali subhorizontali vel curvato-adscendente. — Jalisco: barranca near Guadalajara, June 1886, *Palmer* 417 (type coll.: BG). — Very distinct in seed characters from *P. Albowiana*, which comes from the same locality. — T. 2. Fig. 34.

51. P. **brachysepala,** sp. nov. E basi fruticulosa caules plures erecti sparse ramosi plus minusve flexuosi subdense incurvo-puberuli pilis paucis longis late patentibus adjectis, 2–3.5 dm. alti. Folia media et superiora ovata acuminata vix mucronulata basi rotundato-cuneata, sparse incurvo-puberula, pilis paucis longis laxis adjectis, nervis lateralibus ca. 5-jugis albidis, 2.8–4.5 cm. longa 1.2–2.1 cm. lata, in petiolis 1.5–2.5 mm. longis; ea ima oblongo-ovalia vel obovata apice acuta 5–10 mm. longa 2–4.5 mm. lata. Racemi 15–33-flori 5–7 cm. longi. Flores ut videtur ochro-

leuci, in pedicellis curvatis 2.5–3.5 mm. longis. Sepala ovata solummodo acuta sparse incurvo-puberula ciliolata inferiora 1–1.4 mm. longa superius 1.7 mm. Alae orbiculares late rotundatae vix unguiculatae sparse ciliolatae ceterum glabrae nervosae 5.3 mm. longae 4.8 mm. latae. Carina 4.5–5.7 mm. longa. Petala superiora oblique obovata apice rotundata. Ovarium dense appresse pilosulum. Fructus deest. — San Luis Potosi: Las Canvas, 14 Aug. 1891, *Pringle* 5008 (type: G).

52. P. **pedicellata,** sp. nov. Caules e basi fruticulosa pauci suberecti ramosi subdense incurvo-patenti-puberuli (pilis longis deficientibus) ad 4 dm. alti. Folia media et superiora caulina ovata subacuminata cuspidulata basi rotundato-cuneata vel cuneata subdense pubescentia pilis brevibus patenti-incurvis 2.3–3.4 cm. longa 0.9–1.6 cm. lata, in petiolis 1.5–2 mm. longis, nervis lateralibus ca. 5-jugis; ramealia minora. Racemi laterales et terminales 13–37-flori 3.5–7 cm. longi. Flores verosim. purpurascentes 5–5.5 mm. longi. Sepala ovata vel ovato-lanceolata acuminata subdense patenti-pilosulosa et ciliolata 2.5–3 mm. longa. Alae ellipticae basi unguiculatae apice brevissime subacutae ubique subdense subpatenti-pilosulae 5 mm. longae 4 mm. latae. Petala superiora oblongo-obovata apice subacuta. Capsula submatura deltoideo-quadrata fere e basi sensim angustata pubescens. Semen ad 4.6 mm. longum. Arillus 1 mm. altus, margine scarioso angusto ad 0.3 mm. alto subintegro, lobo dorsali brevissimo. — Vera Cruz: Zacuapan, Apr. 1913, *Purpus* 6308 (type coll.: BG). — T. 1. Fig. 25.

53. P. **cuspidulata,** sp. nov. Caules e basi fruticulosa pauci erecti sparse ramosi ut inflorescentia dense pubescentes pilis brevibus incurvo-patentibus (eis longioribus patentibus subnullis) 1.5–4 dm. alti. Folia ovata acutiuscula vel obtusiuscula cuspidulata basi rotundata nervis lateralibus ca. 4-jugis ubique ut caules subdense pubescentia infra non pallidiora media et superiora 2–3 cm. longa 1.1–1.6 cm. lata; inferiora minora; petioli incurvo-patenti-pilosuli ad 2 mm. longi. Racemi 15–35-flori 5–11 cm. longi. Flores purpurascentes 7–8.3 mm. longi, in pedicellis incurvo-patenti-pilosulis 3–5.5 mm. longis. Sepala ovata vel lanceolato-ovata subacuminata sparse patenti-pilosula et -ciliata 3–3.5 mm. longa. Alae purpurascentes ellipticae apice rotundatae ciliolatae basi sparse puberulae ceterum glabrae 7–8.3 mm. longae 5–5.5 mm. latae. Petala superi-

ora oblique obovato-ovalia apice rotundata. Capsula orbicularis emarginata basi rotundata sparse breviterque patenti-pilosula et ciliolata 8–10 mm. longa lataque. Semen pilosum 5 mm. longum. Arillus 2.2–2.5 mm. altus, margine scarioso undulato sparse piloso, margine dorsali vel horizontali vel paullum curvato-adscendente vel dejecto tunc angulum ca. 45° formante. — PUEBLA: rocks and rocky soil, Cerro de Santa Lucia, near San Luis Tultitlanapa, July 1907, *Purpus* 2764 (TYPE COLL.: BG). — T. 2. FIG. 32.

54. P. **microtricha,** sp. nov. Suffruticulosa ramosa 2.5 dm. alta et ultra basi invisa. Caulis ut racemi subdense incurvo-puberulus. Folia ovata acuta ad acuminata mucronulata basi cuneato-rotundata vel cuneata firma nervis lateralibus 3–5-jugis non reticulatis supra viridia subtus paullulo pallidiora utrinque subdense puberula pilis brevibus incurvis 2.7–3.8 cm. longa 1–1.2 cm. lata, in petiolis incurvo-puberulis 2–3 mm. longis. Racemi laxiflori 3.5–7.5 cm. longi. Flores ca. 12–18 ut videtur ochroleuci, in pedicellis incurvo-puberulis 4 mm. longis. Sepala ovato-lanceolata acuta incurvo-puberula 3.5–3.8 mm. longa. Alae ellipticae apice rotundatae basi cuneatae ad costam et apicem versus sparse incurvo-puberulae 5.5 mm. longae 4 mm. latae. Carina glabra 6 mm. longa. Petala superiora oblongo-obovata basin versus ciliata 5.5 mm. longa. Petala lateralia minima oblonga obtusa ad 1 mm. longa. Capsula elliptica emarginata incurvo-ciliolata et in lateribus praecipue ad septum pubescens pilis paucis brevissimis appressis 9 mm. longa 8 mm. lata. Semen ellipsoideum pilosum 5 mm. longum. Arillus 3 mm. altus palliiformis umbone pilosulo, margine lato scarioso lobulato, lobis lateralibus et dorsali descendentibus sed non appressis vix indicatis. — HIDALGO: Zimapan, *Coulter* 732 p. p. (TYPE: K, fragm. G). — T. 1. FIG. 28.

55. P. **brachytropis,** sp. nov. Suffruticulosa ramosa 2.5 dm. alta et ultra basi invisa. Caulis striatus dense pubescens pilis biformibus (aliis brevibus incurvis aliis longis late patentibus). Folia ovata acuta mucronulata basi cuneata vel cuneato-rotundata firma nervis lateralibus 2–3-jugis inconspicuis concoloria utrinque subsparse pubescentia pilis longiusculis incurvo-patentibus 2.5–3.8 cm. longa 1.2–1.4 cm. lata, in petiolis 1.5 mm. longis. Racemi ad 3 cm. longi ca. 9-flori. Flores ut videtur ochroleuci. Sepala ovata acuta ciliata et sparse pubescentia 2 mm. longa. Alae ellipticae apice rotundatae basi cuneatae ciliolatae ad costam sparse puberulae 3.8

mm. longae 2.5 mm. latae. Carina virescens 3.2–3.5 mm. longa. Petala superiora oblonga 3.3 mm. longa. Capsula submatura elliptica basi paullulum angustata sublate emarginata ciliolata et subdense puberula pilis brevibus subincurvis 9.5 mm. longa 6.5 mm. lata, vallecula ad 1 mm. alta 1 mm. dimetente. Semen non vidi. — HIDALGO: Zimapan, *Coulter* 732 p. p. (TYPE: K, fragm. G).

56. P. AMERICANA Mill. Fruticulose, erect, several-stemmed, about 1.2 dm. high. Stems simple or branched, slightly flexuose, densely pubescent with incurved-spreading rather short equal hairs. Leaves ovate to obovate, acute or the lower rounded at apex, acute at base, mucronulate, firm but rather thin, with about 2 pairs of lateral nerves, somewhat reticulate, rather densely pubescent both sides with incurved-spreading hairs, 1.4–2.3 cm. long, 8–11 mm. wide, on incurved-spreading petioles 1 mm. long; those of the branches sometimes much reduced. Racemes rather loosely flowered, 1.2–4 cm. long. Flowers "purplish." Sepals lanceolate or oblong-lanceolate, rather densely incurved-spreading-pubescent, 4–4.5 mm. long. Wings elliptic, obtuse, rather densely pubescent all over outside with longish incurved-spreading hairs, 5–7 mm. long, 3–4 mm. wide. Keel glabrous, 5 mm. long. Upper petals spatulate-obovate, ciliate below. Capsule (immature) elliptic, emarginate, reticulate, densely pubescent with straightish patent hairs, 6 mm. long, 5.3 mm. wide, on a spreading-pilosulous pedicel 1.8–3 mm. long. Seed not seen. — Mill.! Gardn. Dict. VIII. ed. no. 7 (1768); not of other authors. — VERA CRUZ: 1731, *Houston* (TYPES: B, tracing G). — Wrongly described by Miller as possessing cristate flowers.

57. P. HEBANTHA Benth. Suffruticulose at base, erect, 1.5–2.5 dm. high, few-stemmed, the stems simple or slightly branched, densely pubescent with subincurved-spreading shorter hairs mixed with longer spreading hairs. Lower leaves oval or elliptic, rounded or obtuse at apex, mucronulate, at base broadly cuneate, thinnish, with 3–6 pairs of lateral nerves, somewhat reticulate, subsparsely pubescent with shorter and longer incurved hairs, 1.8–3 cm. long, 1–2.2 cm. wide; middle and upper larger, oval to ovate, acute, 2.5–5.5 cm. long, 1.1–3.2 cm. wide, on petioles 1.5–2 mm. long. Racemes rather loosely flowered, 2–4 cm. long. Flowers apparently ochroleucous. Sepals lanceolate, acuminate, pubescent with subspreading hairs, 2 mm. long. Wings narrowly oblong, obtuse, pu-

bescent everywhere except on margin with comparatively long and spreading hairs, 4.5–5.8 mm. long, 1.2–1.8 mm. wide. Keel sparsely appressed-pubescent, 4–4.6 mm. long. Upper petals narrowly obovate, equalling the keel. Capsule orbicular, densely ciliate and pubescent with rather short wide-spreading hairs, 9 mm. long, 8.5–9 mm. wide. Seed dully silky-pilose, 5 mm. long. Aril membranaceous-scarious, 2.2 mm. deep, short-pilose, the dorsal edge ascending, the ventral subvertical, the margin irregularly lobulate. — Benth.! Bot. Sulph. 67 (1844). — HONDURAS: Gulf of Fonseca, *Sinclair* (TYPE: K, fragment G); sandy loam, arid banks, Gulf of Fonseca, Nov. 1838, *Barclay* 2647 (B). A specimen in hb. Kew., collected by *Friedrichsthal* in Guatemala, is somewhat doubtfully referred here. — T. 2. FIG. 35.

58. P. **Hayesii,** sp. nov. Caules plures e basi fruticulosa erecti sparse ramosi flexuosi subdense pubescentes pilis aliis brevibus incurvo-patentibus aliis longis patentibus vel adscendentibus rectis vel vix curvatis 1–1.2 dm. alti. Folia ovata acuminata basi cuneata ut caules subdense pubescentes reticulato-venosa (venis lateralibus ca. 5-jugis) 2.1–3.2 cm. longa 0.9–1.1 cm. lata, in petiolis 1.5 mm. longis; infima minora ovalia obtusa. Racemi ramos et caules terminantes ca. 15-flori 3.5–3.8 cm. longi. Flores 5–6 mm. longi. Sepala ovata acuminata sparse incurvo-puberula ciliolata 2.7 mm. longa. Alae ovales apice rotundatae basi vix cuneatae ad costam et apicem versus sparse incurvo-puberulae sparse ciliolatae 5.8 mm. longae 4 mm. latae. Carina 5.5 mm. longa. Petala superiora late obovata apice rotundata. Capsula submatura orbicularis emarginata basi truncato-rotundata in lateribus incurvo-puberula subpatenti-ciliolata 8.5 mm. longa 8 mm. lata. Semen (valde immaturum) pilosum. Arillus (submaturus) 1.5 mm. altus, margine scarioso lato parum undulato sparse piloso, margine dorsali descendente angulum ca. 45° formante. — GUATEMALA: plains about Guatemala City, July 1860, *Sutton Hayes* (TYPE: G). — T. 1. FIG. 29.

59. P. **consobrina,** sp. nov. Suffruticulosa infra ramosa 2.4 dm. alta. Caulis ramique dense pubescentes pilis patenti-incurvis pilis longioribus patentioribus perpaucis vel mancis. Folia inferiora ovalia obtusa media et superiora late ovata acuta basi late cuneata subvenoso-reticulatą (venis lateralibus ca. 6-jugis) tenuia sed demum subfirma supra subsparse puberula pilis incurvis infra vix

pallidiora subdense puberula pilis incurvis 2.2–4.8 cm. longa 1.7–2.7 cm. lata in petiolis 2 mm. longis. Racemi subdensiflori ca. 5 cm. longi. Flores ut videtur ochroleuci. Sepala lanceolata acuminata subdense patenti-pilosula 3 mm. longa. Alae oblongo-ovales apice rotundatae ciliolatae ad costam et apicem versus subpatenti-pilosulae 4.5–5.5 mm. longae 2.5–2.8 mm. latae. Carina glabra 4.2 mm. longa. Petala superiora oblonga carinam aequantia. Capsula elliptica emarginata dense ciliolata et subpatenti-pilosula 9 mm. longa 8 mm. lata. Semen sericeum 6 mm. longum. Arillus 2.3–3.8 mm. altus scariosus plus minusve pilosus, umbone minimo subindurato densius piloso, margine anteriore verticali dorsali suberecto, irregulariter dentato-lobato. — GUATEMALA: Escuintla, Dept. Escuintla, 335 m., Mar. 1890, *J. D. Smith* 1980 (TYPE: G); Cerro Gordo, Dept. Santa Rosa, 1065 m., Sept. 1892, *Heyde & Lux* 3941 p. p. (G). Also in hb. Kew. from Guatemala without definite locality, collected by *J. D. Smith* (probably a portion of *J. D. S.* 1980). — T. 2. FIG. 33.

60. P. GUATEMALENSIS A. W. Bennett. Suffruticulose, 0.5 m. high, with few erect branches. Stem slender, rather closely pubescent with short incurved hairs mixed with long spreading ones. Leaves ovate, the upper acuminate, scarcely mucronulate, at base rounded-cuneate, reticulate with 5–7 pairs of lateral veins, firm and subcoriaceous, ciliate, above dark green, subsparsely pubescent with short and long incurved-appressed hairs, beneath paler, sparsely incurved-puberulous along the veins, with a few longer looser hairs, 2.5–3.9 cm. long, 8–15 mm. wide, on incurved-puberulous and subspreading-pilose petioles 1.5–3 mm. long. Racemes somewhat densely flowered, incurved-puberulous, 4.5–9.5 cm. long. Sepals lanceolate, acute, ciliolate and sparsely incurved-puberulous, 3 mm. long. Alae oblong, rounded at apex, incurved-puberulous along costa and toward apex, 5–6 mm. long. Keel 7 mm. long. Upper petals oblong, 6 mm. long. Capsule (immature) elliptic, rather densely pilosulous with short spreading hairs, 8 mm. long, 6.5 mm. wide. Seed (quite immature) glabrous, 2.2 mm. long. Arillus 1.1 mm. high, cloak-like, closely investing the seed, subentire with short but distinct horizontal dorsal lobe, the sides membranous-scarious, unlobed. — A. W. Bennett! Journ. Bot. xxxiii. 108 (1895). — GUATEMALA: bushy places, Coban, 1340 m., *Tuerckheim* 298 (TYPE: K). — Cited by Bennett as " Kurtz 298," but the

label of the fragments communicated to Kew Herbarium by Bennett is marked, presumably by Kurtz himself " 298. De Türckheim: Flora guatemalensis. — Edit. C. Keck." It is by no means the same species (or collection ?) as *Tuerckheim* 298 of J. D. Smith's distribution (as *P. americana*), which is *P. costaricensis* Chod. The wings are not glabrous, as stated by Bennett, but distinctly puberulous along costa and toward apex.

61. P. Durandi Chod. Suffruticulose, erectish, about 3.5 dm. high, sparsely branched near base. Stems simple or sparsely branched, somewhat zigzag above, slender, densely pubescent with incurved short hairs mixed especially toward base of stem with long spreading ones. Leaves ovate or ovate-lanceolate (or the lower oval and obtuse), acute to acuminate, slightly mucronulate, subchartaceous, somewhat reticulate (lateral veins 5–6 pairs), rather sparsely pubescent both sides with short incurved and long ascending or subspreading hairs, 1.7–4.4 cm. long, 9–16 mm. wide, on incurved-puberulous petioles 1.5–2 mm. long. Racemes subsparsely flowered, 4–5 cm. long. Flowers apparently ochroleucous. Sepals lanceolate, acute, rather densely incurved-puberulous, 2–2.8 mm. long. Wings oblong, rounded at apex, sparsely ciliolate, subsparsely appressed-puberulous along costa and toward apex, 6 mm. long, 2.5 mm. wide. Keel very blunt, 6 mm. long. Upper petals oblong, 4.8 mm. long. Capsule elliptic, strongly emarginate, pubescent on sides, 9–10 mm. long, 8–9.3 mm. wide. Seed 5.2 mm. long, subsparsely pilose. Arillus 3.2 mm. high, somewhat pilose especially at apex, scarious, somewhat umbrella-shaped, the ventral edge vertically descending, the dorsal straight, erected at an angle of about 45°, the margin subentire or very indistinctly crenate. — Chod. Bull. Soc. Bot. Belg. xxx. 300 (1891); in Dur. & Pitt. Primit. Fl. Costar. i. 203 (1891); Monog. ii. 27. t. 14. f. 13–16 (1893). *P. Durandi* var. *crassifolia* Chod. Bull. Soc. Bot. Belg. xxx. 301 (1891); in Dur. & Pitt. Primit. Fl. Costar. i. 204 (1891). — Guatemala: *Skinner* (K). — Skinner's plants differ from Chodat's description (based on *Pittier* 519, 657, and 999, and *Tonduz* 3073, all from Costa Rica) in their more pubescent leaves, sparsely ciliolate wings, and larger capsule ciliate with rather long hairs, and may prove distinct when compared with Chodat's types.

62. P. trichoptera Chod. Stems erect, hirsute, slender, 1–2 dm. high, simple or sparsely branched, from a persistent base.

Leaves from lance-elliptic to lanceolate or linear, sparsely hirsute above, conspicuously ciliate beneath, conspicuously venose beneath with prominent lateral nerves, 2–4 cm. long, 7–16 mm. wide. Racemes terminal, 7–12-flowered, about 2–4 cm. long; rachis puberulous or subhirsute; pedicels 2.5 mm. long. Flowers violaceous, 6 mm. long. Sepals lance-linear, hirsute, acute. Wings obovate-oblong, very obtuse, slightly reticulate, sparsely long-haired on the back. Upper petals shorter than the keel, with broadly linear limb, at apex acute or subacute, neither dilated nor emarginate. Ovary obovate, long-pilose; immature capsule elliptic-obovate, very hirsute. — Chod. Bot. Jahrb. lii. Beibl. 115. 74 (1914), as *P. trichopterum*. — Based by Chodat on *Seler* 2796 and 2904, from limestone hills, Uaxac Canal, 1300–1400 m., Dept. Huehuetenango, Guatemala. — Not seen; description compiled.

63. P. COSTARICENSIS Chod. Several-stemmed from a suffruticulose base, 2–6 dm. high, the stems ascending or erect, more or less densely incurved-puberulous with few or many longer spreading hairs intermixed. Leaves ovate to ovate-lanceolate, acute or usually acuminate, at base cuneate or broadly rounded, mucronulate, thin but chartaceous, somewhat reticulate (lateral nerves 4–6 pairs), subsparsely incurved-puberulous both sides, usually with a few longer but scarcely spreading hairs intermixed, 2.5–6.6 cm. long, 8–23 mm. wide, on petioles 1–2 mm. long. Racemes somewhat loosely flowered, 3–12.5 cm. long. Flowers purplish. Sepals lanceolate, acuminate, cilate and somewhat densely incurved-puberulous, 2.5–3 mm. long. Wings oblong to oblong-oval, rounded at apex, sparsely puberulous along costa and toward apex, 8–10 mm. long, 4.2–6 mm. wide. Keel glabrous, 8–9.5 mm. long. Upper petals obovate-oblong, 7 mm. long. Capsule elliptic, emarginate, ciliate and puberulous with short spreading hairs, 10.5 mm. long, 9 mm. wide. Seed (immature) sparsely short-pilose. Aril (submature) 2.7 mm. high, with small densely pilose umbo, the undulate-lobulate scarious margin broad; dorsal margin abruptly erectish, anterior obliquely descending. — Chod. Bull. Soc. Bot. Belg. xxx. 298 (1891); in Dur. & Pitt. Primit. Fl. Costar. i. 201 (1891); Monog. ii. 30. t. 14. f. 21–24 (1893). (?) *P. guatemalensis* Gand. Bull. Soc. Bot. Fr. lx. 454 (1913), not of A. W. Bennett. — GUATEMALA: *Skinner* (K); mountains near Guatemala City, 15 Aug. 1860, *Sutton Hayes* (G); Cerro del Carmen,

Oct. 1865, *Bernoulli* 120 (K); Capestillo, Volcan del Fuego, 1400 m., Aug. 1873, *Salvin* (K); Volcan Acatenango, Dept. Zacatepequez, 2135 m., Aug. 1892, *W. C. Shannon* 3689 (K); Coban, 1300 m., Nov. 1902, *Tuerckheim* 8379 (GK); Coban, 1350 m., Nov. 1906, *Tuerckheim* II. 650 (B); Coban, 1310 m., Nov. 1886, *Tuerckheim* 298 (distr. J. D. Smith: GK); San Geronimo, 1861, *Salvin & Godman* (K); Cerro Gordo, Dept. Santa Rosa, 1065 m., Sept. 1892, *Heyde & Lux* 3941 p. p. (G). COSTA RICA: thickets along the Torres River, at San José, 1160 m., Aug. 1896, *Tonduz* 2052 (GK); San Francisco de Guadalupe, 1170 m., Nov. 1893, *Tonduz* 1553 (G). — T. 2. FIG. 30.

64. P. **biformipilis,** sp. nov. E basi fruticulosa caules plures ramosi erecti 3.5–6 dm. alti dense molliter pubescentes pilis aliis brevioribus incurvis aliis crebris longis rectis late patentibus. Folia ovata vel oblongo-ovata acuminata cuspidulata basi rotundata venosa (nervis lateralibus 6–8-jugis) supra saturate viridia subtus paullulo pallidiora utrinque sicut caules pubescentia (pilis paginae inferioris numerosis) 3–4.9 cm. longa 1.1–2 cm. lata, in petiolis 1.2–2 mm. longis; ea inferiora minora ovalia plus minusve obtusa. Racemi densiflori 3.5–7 cm. longi. Flores purpurascentes 8–9 mm. longi, in pedicellis 2–2.5 mm. longis; bracteis subulatis subpersistentibus. Sepala ovata vel oblongo-ovata acuminata incurvo-pubescentia et ciliata sparse pilosa ad 3.7 mm. longa. Alae oblongo-ovales apice rotundatae basi non unguiculatae infra sparse incurvo-puberulae apice sparse ciliolatae et puberulae ceterum glabrae 8.7 mm. longae 4.7 mm. latae. Carina 7 mm. longa. Petala superiora oblonga apice retusa glabra. Tubus staminalis apice et filamenta libera infra pubescentia. Capsula (immatura) elliptica emarginata basi rotundata ciliata et dense incurvo-patenti-pilosula 8 mm. longa 6.5 mm. lata. Semen (submaturum) breviter pilosum 4.1 mm. longum. Arillus (submaturus) 2.5 mm. altus, umbone parvo dense piloso, margine scarioso lobulato sparsissime piloso, margine dorsali subhorizontali anteriore recte verticali. — VERA CRUZ: open woods and fields, Zacuapan, Nov. 1906, *Purpus* 2364 (TYPE COLL.: BG); temperate and subtropical region, Sept. 1828, *Schiede & Deppe* (B); Mirador, Sept. 1838, *Linden* 174 (K); fields and woods, 915 m., 1840, *Galeotti* 879 (K). — T. 2. FIG. 37.

65. P. PANAMENSIS Chod. Suffruticulose at base, erectish, several-stemmed, 2–3 dm. high. Stems stoutish, branched, densely

softly pilose like the inflorescence-axis and pedicels with subspreading slightly curved shorter and wide-spreading slightly longer hairs. Leaves ovate, obtusish to acute, mucronulate, cuneate at base, firm, with about 5 pairs of lateral nerves, somewhat reticulate, above dark green, softly pubescent with longish ascending hairs, beneath somewhat paler, densely and softly spreading-pilose along the veins, less densely or sparsely so between them with spreading or ascending hairs, 2.5–7.1 cm. long, 1.1–2.8 cm. wide, on densely spreading-pilose petioles 1.5–2 mm. long. Racemes rather loosely flowered, 2.5– (at maturity) 9 cm. long. Flowers probably purplish. Sepals lanceolate to ovate, acute, spreading-pilose, 3–3.6 mm. long. Wings oblong, rounded at apex, abruptly cuneate at base, rather densely pilose along costa and toward apex with longish spreading hairs, 7–8 mm. long, 3.8–4.5 mm. wide. Keel glabrous, 7 mm. long. Upper petals obovate-spatulate, densely ciliate below, 6.5 mm. long. Capsule elliptic, emarginate, more or less densely ciliolate and puberulous with short wide-spreading hairs, rather deeply but narrowly emarginate, 9–11 mm. long, 7–8.8 mm. wide. Seed ellipsoid, pilose, 6 mm. long. Aril 3 mm. long, with very indistinct umbo, scarious, somewhat pubescent and ciliate, with obliquely ascending dorsal edge and obliquely descending ventral, the margin about 6-toothed, not lobed. — Chod. Monog. ii. 35 (1893). — Panama: Boquete, Veraguas, Feb. 1849, *Seemann* 1645 (BK); without locality, *Seemann* p. p. (G: probably a part of *Seemann* 1645). — Based by Chodat on specimens collected by *Wagner* ("fasc. 3. 2 Send.") in Panama in the Provinces Chiriquiri and Veraguas.

66. P. **isotricha,** nom. nov. Suffruticulosa erecta 4 dm. alta et ultra basi invisa. Caulis sparse ramosus dense pubescens pilis aliis lateraliter incurvis subaequalibus aliis perpaucis paullo longioribus incurvis adjectis. Folia ovata vel rhomboideo-ovata rare ovalia acuta rare obtuse mucronata basi cuneata chartacea subreticulata (venis lateralibus ca. 5–6-jugis) supra subsparse subtus subdense puberula pilis incurvis brevibus (subtus perpaucis longioribus interdum adjectis) 3.5–6 cm. longa 1.1–2.5 cm. lata, in petiolis 2–2.5 mm. longis. Racemi anthesi 4–7 cm. longi aetate 15–18.5 cm. longi subdensiflori ut caules puberuli. Sepala ovato-lanceolata acuminata sparse pilosa et ciliata 4 mm. longa. Alae oblongo-obovatae obtusae in costa sparsissime puberulae margine glabrae 8–9.5 mm.

longae 3–4.5 mm. latae. Carina glabra 7.5–8.5 mm. longa. Petala superiora oblonga 6 mm. longa. Capsula magna elliptico-orbicularis 10–12 mm. longa 10–11.5 mm. lata valde emarginata (vallecula angusta 1.5 mm. alta) reticulata ciliata in lateribus subdense puberula pilis brevibus patentibus. Semen pilosum 6 mm. longum. Arillus 3.7 mm. altus chartaceo-scariosus sparse pilosulus, margine ventrali recte descendente dorsali adscendente angulum ca. 30° formante. — *P. platycarpa* Benth. var. *stricta* Chod.! Monog. ii. 27 (1893), not *P. stricta* St. Hil. — GUATEMALA: between Rabinal and Santa Ana, Vera Paz, Sept. 1870, *Bernoulli* 1092 (TYPE: K, fragm. G); between Chisoy and Rabinal, Sept. 1870, *Bernoulli & Cario* 3218 (K, fragm. G). — T. 2. FIG. 31.

67. P. SELERI Chod. Stems branched, puberulous, 2–3 dm. long, the flowering branches 1 dm. long. Leaves ovate-lanceolate, acute or apiculate, glabrescent, 3–5.5 cm. long, 1.2–2.2 cm. wide, distinctly petioled. Racemes terminal, rather loosely flowered, 15–20-flowered, 5–10 cm. long, attenuate. Flowers 9 mm. long or rarely longer, on pedicels 2.5–3 mm. long. Upper sepal conspicuously arcuate, very acute. Wings elliptic-oblong, glabrous, subobtuse or shortly acute, barely cuneate at base, twice as long as broad, 9 mm. long, 3-nerved. Keel with limb about as long as claw. Upper petals broad at base, curved, the limb gradually acute, acutish at apex. Filaments glabrous. Ovary long-pilose. Capsule (immature) orbicular, ciliate, narrowly margined. Seed unknown. — Chod. Bot. Jahrb. lii. Beibl. 115. 73 (1914). — Described by Chodat from *Seler* 3244, from Cuesta de la Conception, and *Seler* 3259, from Jacaltenango, Dept. Huehuetenango, Guatemala. — Not seen; description compiled.

Subsect. C. **Adenophora,** subsect. nov. Arillus trilobus equitans; folia uniformia oblonga vel oblongo-linearia vel obovata valde glanduloso-punctata parva (2–9 mm. longa); capsula oblongo-ovata immarginata glanduloso-punctata. Species typica *P. macradenia* Gray.

a. Leaves obovate, mucronate, *b.*
  b. Leaves incurved-pubescent . . . . . 68. *P. glandulosa.*
  b. Leaves practically glabrous . . . . . 69. *P. phoenicistes.*
a. Leaves oblong-linear, obtuse, thick, canescent-hispid . . 70. *P. macradenia.*

68. P. GLANDULOSA HBK. Stems very numerous from a thick woody root, fruticulose at base, branched, diffuse, 1–2 dm. long,

flexuose, somewhat gray-pubescent with incurved hairs, densely leafy. Leaves obovate, rounded at the mucronulate apex, cuneate at base, 1-nerved, somewhat dull with incurved puberulence, densely translucent-glandular-dotted, 4.5–8 mm. long, 1.5–6 mm. wide, on petioles 0.5 mm. long. Racemes axillary, very short, 1–2-flowered. Flowers purple, 6–7.5 mm. long. Sepals oblong-ovate, obtuse, ciliate and puberulous, 1.2–1.5 mm. long, the upper often subpersistent. Wings spatulate-obovate, long-cuneate at base, rounded at apex, sparsely ciliate, purple, 7.5 mm. long, 3.7 mm. wide. Keel 3-lobed, the lateral lobes broad and rounded, 4.5 mm. long. Upper petals oblong-obovate, rounded at apex, 5 mm. long. Staminal tube ciliolate at base. Capsule "elliptic, deeply emarginate, slightly pilose, dotted with whitish glands." Seed "oblong, clothed with appressed hairs." Aril "galeiform, equitant, with very short lobes, 3–4 times shorter than the seed." — HBK. Nov. Gen. v. 404. t. 510 (1821); Chod. Monog. ii. 37. t. 14. f. 37–39 (1893). *Viola punctata* Humb. & Bonpl. ex R. & S. Syst. v. 391 (1819), not *P. punctata* A. W. Benn. Journ. Bot. xvii. 172 (1879). *P. Greggii* Wats.! Proc. Am. Acad. xvii. 325 (1882). — Nuevo Leon: west of Cerralbo, 29 May 1847, *Gregg* (type of *P. Greggii*: G). San Luis Potosi: dry hills, Micos, 1 Aug. 1891, *Pringle* 4006 (G). — The flowers are described by Watson, presumably from Gregg's label, as white, but as some of those in *Pringle* 4006 are manifestly purple, while others have faded to the same dull whitish hue as in Gregg's plant, I have taken the normal color of the fresh flower as purple.

69. P. **phoenicistes,** sp. nov. Caules plures e basi fruticulosa procumbente suberecti vel laxe diffusi ramosi laete virides incurvo-puberuli et glanduloso-punctati dense foliosi 6–15 cm. longi. Folia cuneato-obovata apice rotundata mucronulata basi cuneata dense glanduloso-conspersa subtus ad costam obscurissime incurvo-puberula ceterum glabra 5.5–7 mm. longa 2.5–4.5 mm. lata, in petiolis sparse incurvo-puberulis 0.5 mm. longis. Flores purpurei in racemis brevissimis 1-floris 6–7 mm. longi. Sepala lanceolata acuminata margine sparsissime ciliolata ceterum glabra glanduloso-punctata 2.5 mm. longa, superius persistens. Alae spathulato-obovatae apice obtusae basi longe cuneatae purpureae subsparse incurvo-puberulae et ciliolatae 6 mm. longae 2.5 mm. latae. Carina ut in *P. glandulosa*, 6 mm. longa. Petala superiora obovata apice rotun-

data 7 mm. longa. Capsula oblongo-elliptica ciliolata ad basin sparse incurvo-puberula glanduloso-adspersa inaequaliter emarginata basi rotundata 5 mm. longa 3 mm. lata, in stipe 2 mm. longo. Semen (immaturum) patenti-pilosulum 4 mm. longum. Arillus corneolus 1–1.2 mm. altus, umbone magno sparse piloso, lobis 3 corneolo-scariosis subaequantibus. — San Luis Potosi: crevices of steep cliffs, Sierra de Guascama, Minas de San Rafael, June 1911, *Purpus* 5166 (type coll.: BG). — T. 2. Fig. 41.

70. P. macradenia Gray. Stems very numerous, branched, crowded, erectish or ascending, fruticulose below, from a thick woody root, flexuous, densely leafy, densely canescently incurved- or incurved-spreading-puberulous, 3.5–21 cm. long. Leaves oblong, linear-oblong, or oblong-lanceolate, obtuse, rounded at base, thick, canescently puberulous like the stem, thickly gland-dotted, subsessile or on whitish petioles 0.4 mm. long, 1.2–6.3 mm. long, 0.3–1.3 mm. wide. Flowers in 1–2-flowered very short racemes, purple, 5–5.5 mm. long. Sepals oblong-ovate, obtuse, gland-dotted and subpatently pilosulous, 1.7–2.1 mm. long. Wings obovate, cuneate at base, rounded at apex, sparsely spreading-puberulous, ciliolate, purple, 5–5.5 mm. long, 2.5 mm. wide. Keel 3-plicate-lobed, 4.5 mm. long. Upper petals oblong, retuse at apex, 5 mm. long. Capsule oblong to oblong-ovate, emarginulate, densely and canescently incurved-puberulous and gland-dotted, 5–5.5 mm. long, 2.5–3 mm. wide. Seed silky-pilose, comose at base, 4 mm. long. Aril 1.2–1.6 mm. high, with corneous vaulted sparsely pubescent umbo 0.9–1.1 mm. high and 3 short descending scarious-ended subappressed lobes. — Divisible into two varieties.

Var. **genuina.** Folia saepius lanceolata vel oblongo-lanceolata vix crassa supra manifeste complanata dense canescenter incurvo- vel incurvo-patenti-puberula 2–6.3 mm. longa 0.6–1.3 mm. lata. — *P. macradenia* Gray! Pl. Wright. i. 39 (1852); Chod. Monog. ii. 36. t. 14. f. 33–36 (1893); Rob. in Gray, Syn. Fl. i. pt. 1. 450 (1897). — Coahuila: Juarez, on Sabinas River, 160 km. north of Monclova, Sept. 1880, *Palmer* 70 (BGK); Saltillo, 15–30 Apr. 1898, *Palmer* 29 (G); Sierra de Paila, Oct. 1910, *Purpus* 4759 (BG). Also in Arizona and New Mexico. — T. 2. Fig. 42.

Var. **glanduloso-pilosa** (Chod.), comb. nov. Folia linearia vel lineari-lanceolata crassa supra concava vel sulcata subtus convexa sparse incurvo-patenti-puberula non canescentia 1.2–3 mm. longa

0.3–0.5 mm. lata. Caules minus pubescentes. — *P. glanduloso-pilosum* Chod.! Bot. Jahrb. lii. Beibl. 115. 72 (1914). — San Luis Potosi: Buena Vista, Nov. 1910, Purpus 4913 (type coll.: BG); Sierra de Guascama, Minas de San Rafael, May 1911, *Purpus* 5167 (BG).

This does not seem specifically distinct from *P. macradenia*. There are no flowers on the specimen of *Purpus* 4913 in the Gray Herbarium, but those of 5167, which comes from the same region and is considered identical with 4913 by Mr. Brandegee, are 5.3 mm. long and thus no smaller than those of *P. macradenia*. Nor do I find a difference in the stigmas of the two. Since furthermore various specimens that must be referred to *P. macradenia* show an approach to *P. glanduloso-pilosum* in leaf-form or pubescence, the latter seems best considered as a southern variety of the typical more northern *P. macradenia*.

Sect. 2. **Biloba,** sect. nov. Arillus glaber equitans lobis lateralibus 1/4 ad 1/2 longitudinis seminis, dorsali obsoleto. Sepala inferiora petaloidea decidua, superius herbaceum persistens. Species typica *P. Parryi* A. W. Bennett.

a. Stems densely canescent-pilose; lower sepals glabrous; flowers purple ..... 71. *P. Purpusii.*
a. Stems finely incurved-puberulous; lower sepals ciliate; flowers greenish ..... 72. *P. Parryi.*

71. P. Purpusii Brandegee. Fruticulose, the stems several, simply or subsimply branched, erect, up to 2.5 dm. high, densely pilosulous with incurved-spreading hairs, the younger parts canescent. Leaves oval to oblong-oval, rarely orbicular, acute to obtuse or rounded at both ends, more or less densely incurved-spreading-pubescent both sides, 9–14 mm. long, 4–11 mm. wide, on petioles 1–2 mm. long. Racemes terminal, sessile or short-peduncled, up to 4.5 cm. long, loosely 10–13-flowered. Flowers purplish, 4–4.5 mm. long, exceeding their pedicels, these equalling the narrowly lanceolate bracts. Lower sepals petaloid, purplish, obliquely oblong-obovate, not clawed, 3.5 mm. long, 1.4 mm. wide; upper sepal herbaceous, ovate, subglabrous, obtusish, 3 mm. long. Keel whitish with yellowish tip, 3 mm. long. Wings obovate-oval, barely retuse, 4.7 mm. long, 2.8 mm. wide. Upper petals purplish-red, white toward end, united to keel about one-half their length, obovate, 4.5 mm. long. Stigmatic lobes approximate at the flaring

style apex. "Capsule pubescent, emarginate, pendulous." Seed silky-pubescent. Aril with large corneous umbo and two oblong vertical appressed lobes half as long as seed. — Brandeg.! Univ. Calif. Pub. Bot. iv. 88 (1910). — PUEBLA: Acatitlan, 1830–2135 m., June 1909, *Purpus* 3922 (TYPE COLL.: BG).

72. P. PARRYI A. W. Bennett. Suffruticulose, several-stemmed from a creeping woody root, the stems often decumbent below, branched, 9 cm. long or less, incurved-puberulous, not at all canescent. Leaves oval to orbicular, rounded to obtuse at both ends, distinctly mucronate, incurved-puberulous, veinless except for the midnerve, 6–11 mm. long, 3–10 mm. wide, on petioles 1–1.5 mm. long. Racemes very short, axillary, 1–4-flowered, flexuous. Flowers greenish, 3.6 mm. long. Lower sepals greenish, petaloid, narrowly oblong-obovate, obtuse, pubescent down costa and along margin with incurved-spreading hairs, 2.8 mm. long, 0.8 mm. wide; upper sepal oblong, herbaceous, obtusish, similarly pubescent, 2 mm. long. Wings obovate, apiculate, 3.5 mm. long, 1.4 mm. wide. Keel very blunt, 2.7 mm. long. Upper petals narrowly oblong, slightly enlarged toward apex, obtuse, porrect, 3.8 mm. long. Capsule orbicular, emarginulate, venose, minutely and sparingly incurved-puberulous, 3.5 mm. long and wide. Seed plump, short-pubescent, 2.5–2.8 mm. long. Aril 1.5–1.6 mm. deep, with small corneous umbo and two oblong scarious descending appressed lateral lobes 1.2 mm. long. — A. W. Benn.! Journ. Bot. xvii. 140 (May 1879); in Hemsl. Diag. Pl. Nov. ii. 21 (July 1879); (*P. Parreyi*) Chod. Monog. ii. 39. t. 14. f. 40–42 (1893). — SAN LUIS POTOSI: 1830–2440 m., 1878, *Parry & Palmer* 40 (TYPE COLL.: BGK); shady places, near San Luis Potosi, Aug.–Oct. 1877, *Schaffner* 6 (GK); without locality, *Schaffner* 496 (B). — T. 2. FIG. 43.

Sect. 3. **Huateca,** sect. nov. (Anogram.) Sepala herbacea persistentia; alae petaloideae persistentes; arillus umbone subcorneo et lobis duobus lateralibus oblongis subappressis. Species unica *P. tehuacana* Brandegee.

73. P. TEHUACANA Brandegee. Suffruticulose, very many-stemmed from a woody rootstock, the stems erect, more or less branched, up to 1.5 dm. high, canescent with a dense spreading-incurved puberulence. Leaves oblong, obtusish at both ends, rather densely incurved-spreading-puberulous, 5–10 mm. long, 1.5–2.5

mm. wide, on petioles about 0.5 mm. long or less. Flowers mostly in 1-flowered axillary or terminal racemes, purplish-yellowish, 5–6 mm. long. Sepals oblong, acute, 5-nerved, incurved-spreading-puberulous, 4–4.8 mm. long, the upper the longer. Wings oval-obovate, rounded to truncate at apex, short-clawed, yellowish more or less suffused with purple, 5-veined, incurved-spreading-puberulous, 6 mm. long, 4 mm. wide. Keel greenish-yellow, somewhat purplish-tinged, 4.5 mm. long, with two rounded yellowish lateral lobes. Upper petals obovate-oblong, united to staminal tube for 2/5 their length, 4.5 mm. long. Capsule elliptic, slightly narrowed upwardly, scarcely emarginate, narrowly margined, ciliate, glabrous on sides, 4.8 mm. long, 3.9 mm. wide. Seed obconic-obovoid, silky-pilose, 3.5–3.8 mm. long. Aril 1.3–1.5 mm. deep, with small corneous umbo and two oblong oblique not closely appressed scarious lateral lobes more or less notched at apex. — Brandeg.! Univ. Calif. Pub. Bot. iv. 273 (1912). — PUEBLA: mountains north of Tehuacan, Sept. 1911, *Purpus* 5706 (TYPE COLL.: BG); Tehuacan, June 1912, *Purpus* 5851 (BG). — T. 2. FIG. 44.

Subgenus IV. **HEBECLADA** (Chod.), comb. nov.

Sepals herbaceous, generally glandular-ciliate, the two lower united nearly or quite to apex, all persistent. Wings petaloid, persistent, oval or orbicular. Keel crestless, beakless, obtuse, about equal to wings. Upper petals shorter than keel, united to the staminal tube toward the base. Filaments united for more than half their length. Style much longer than ovary, bent upward; upper stigmatic lobe obtuse, terminating style, the lower approximate, represented by a tuft of hairs. Capsule herbaceous, ciliate or glabrous. Seeds pubescent, often silky. Aril generally corneous, vaulted, scarcely lobed. — *Polygala* L. sect. *Hebeclada* Chod. Arch. Sci. Phys. Nat. Genève xxv. 698 (1891); Monog. ii. 43 (1893). *Polygala* sect. *Syngala* Gris. Fl. Br. W. I. 28 (1859), in part. *Polygala* sect. *B.* A. W. Bennett, Journ. Bot. xvii. 141 (1879).

a. Wings 7.5–14 mm. broad ..... **Sect. 1. APOPETALA.**
a. Wings 5.3 mm. broad or less ..... Sect. 2. ADENOTRICHA, p. 63.

Sect. 1. **Apopetala,** sect. nov. Sepala densissime ciliata vel in margine subglabra pilis saepissime eglandulosis; flores magni alis 7.5–14 mm. latis; frutices foliis magnis ovatis petiolatis. Species typica *P. apopetala* Brandegee.

a. Sepals densely ciliate, *b*.
b. Wings densely ciliolate, *c*.
c. Branches of inflorescence puberulent to densely strigose, *d*.
d. Seed pilose-tomentose; capsule 8 mm. long, 10 mm. wide ..... 74. *P. floribunda.*
d. Seed gray-pilose, not tomentose; capsule 7 mm. long, 7.5 mm. wide ..... 75. *P. sphaerospora.*
c. Branches of inflorescence subtomentose ..... 76. *P. Securidaca.*
b. Wings glabrous or minutely glandular-ciliolate, *e*.
e. Wings 12–15 mm. long ..... 77. *P. apopetala.*
e. Wings 7–8 mm. long ..... 78. *P. hondurana.*
a. Sepals sparsely glandular-ciliate; wings glabrous ..... 79. *P. tonsa.*

74. P. FLORIBUNDA Benth. Frutescent, branched, erect, 1–1.6 m. high, the stems and branches sparsely or densely pubescent with more or less incurved or somewhat spreading hairs of unequal length, occasionally strigillose. Leaves ovate, acute or shortly acuminate, mucronate, cuneate or rounded at base, chartaceous at length coriaceous, finely reticulate (lateral nerves 9–10 pairs), green above, paler and finely whitish-maculate beneath, rather sparsely strigillose or at length glabrate on both surfaces, 3.5–9.2 cm. long, 1.2–3.8 cm. wide, on petioles 3–7 mm. long. Racemes rather loosely many-flowered, up to 2.3 dm. long, axillary and terminal, rarely branched, the axis and pedicels (8–13 mm. long) varying from appressed-puberulous to shortly subspreading-pilosulous. Flowers violet-purple. Sepals subequal, obtuse, oval, very densely ciliolate, very sparsely pubescent dorsally, 3.8 mm. long. Wings suborbicular, rounded at apex, abruptly short-clawed at base, rather strongly venose, ciliolate, otherwise glabrous, 8–11 mm. long, 8–10 mm. wide. Keel ciliate on claw, 9–10 mm. long. Upper petals obovate, ciliate above toward base, 8 mm. long. Lateral petals present, lanceolate, 1.5 mm. long. Capsule ciliolate, otherwise glabrous, distinctly stiped, transversely broad-oblong, strongly obcordate, reticulate, 8 mm. long, 10 mm. wide. Seed (with aril removed) globose, not compressed, pilose-tomentose, 3–3.5 mm. in diameter. Aril 2 mm. long, thick, fleshy-coriaceous, somewhat excavated laterally, sparsely pilose. — Benth.! Pl. Hartw. 58 (1840); A. W. Benn. Journ. Bot. xvii. 141 (1879); Chod. Monog. ii. 64. t. 15. f. 39–40 (1893). *P. americana* ζ. *floribunda* (Benth.) Ktze. Rev. i. 48 (1891). — CHIAPAS: pine forests, Pueblo Nuevo, Feb. 1840, *Linden* 172 (K); walls of temple at Zonaguia, *Hartweg* 447 (TYPE COLL.: BK); without definite locality, 1843–44, *Jurgensen* 541 (BGK), *Ghiesbreght* 22 (G), 737 (G). Mexico without locality; *Jurgensen*

412 (K), 453 (K); *Sallé* (K). GUATEMALA: *Skinner* (GK); mountains, Jan. 1841, *Hartweg* 572 (BK); Chilasco, 1861, *Salvin & Godman* (K); Pansamala, 1220 m., May 1887, *Tuerckheim* 390 (K); Guatemala City, 1525 m., Feb. 1890, *J. D. Smith* 1857 (GK); Carrizal, Dept. Santa Rosa, 1525 m., Jan. 1892, *Heyde & Lux* 4313 (GK); Coban, 1350 m., Mar. 1907, *Tuerckheim* II. 703 (BG); between Jacaltenango and San Martin, 1615–2135 m., 24 Dec. 1895, *Nelson* 3603 (G); Tactic, Dept. Alta Verapaz, 1800 m., Mar. 1903, *Tuerckheim* 8376 (G). — T. 2. FIG. 39.

75. P. SPHAEROSPORA Chod. Shrub with slender striate slightly puberulous branches. Leaves lanceolate, acuminate, at base long-cuneate, chartaceous or subherbaceous, glabrescent, 3.8–7 cm. long, 1.3–2.4 cm. wide, on petioles 2–3 mm. long, puberulous. Racemes terminal, at length loosely flowered, the rachis appressed-puberulous; pedicels 10 mm. long, at length nodding. Flowers 9–10 mm. long, like those of *P. floribunda*. Capsule shorter than the wings, 7 mm. long, 7.5 mm. broad. Seeds globose, grayish but not tomentose with subappressed hairs. Aril deeply and irregularly rugose, 1/3 shorter than the seed, glabrous and shining. — Chod. Bot. Jahrb. lii. Beibl. 115. 75 (1914), as *P. sphaerosporum*. — Described by Chodat from *Seler* 3393, from sandstone slates, above San Geronimo, Dept. Samala, Guatemala. — Not seen; description compiled.

76. P. SECURIDACA Chod. Shrub, the branches woody, densely leafy, above subtomentose. Leaves ovate-elliptic, barely acute, obtusiusculous, usually rounded at base, subcoriaceous, the midnerve prominent beneath, the lateral nerves 6–7 pairs, softly tomentellous, 4.2–7 cm. long, 2–3.3 cm. wide, on petioles 2.5–3 mm. long, tomentellous. Racemes terminal, solitary or rarely subpaniculate, subcorymbiform or shortly cylindric, 3–5 cm. long, 2.5 cm. broad; rachis tomentellous or hirsute; pedicels hirsute, 7 mm. long. Flowers 10–12 mm. long. Wings as in *P. floribunda*. Fruit and seed unknown. — Chod. Bot. Jahrb. lii. Beibl. 115. 76 (1914). — Described by Chodat from *Seler* 3345, mountain wood above Copan, Honduras. — Not seen; description compiled.

77. P. APOPETALA Brandegee. Shrub or small tree, 0.6–5 m. high, branched, the branches woody, grayish-green, sparsely or densely strigillose, leafy. Leaves ovate, acutish to truncate or

retuse at the mucronulate apex, cuneate into the margined petiole, thin but firm, equally green both sides, sparsely strigillose, somewhat veiny (lateral veins ca. 7 pairs, reticulate-anastomosing), 2.5–5.1 cm. long, 1.7–2.2 cm. wide, on rather densely strigillose petioles 2–3 mm. long. Racemes terminating branches, 10–32-flowered, 5–19 cm. long. Flowers pinkish-purple, very handsome, 1.3–1.5 cm. long, on very sparsely appressed-hairy pedicels 7–12 mm. long. Sepals densely ciliate, the upper 5 mm. long, the lower 4 mm. long. Wings orbicular, retuse at the rounded apex, shortly unguiculate at base, very minutely glandular-ciliolate, otherwise glabrous, in fruit strongly reticulate, 12–15 mm. long and wide. Keel 9 mm. long. Upper petals ligulate. Lateral petals present. Capsule quadrate-orbicular, emarginate, glabrous, 1.5–1.9 cm. long, 1.5–1.7 cm. wide. Seed ellipsoid, bronzy-brown, pilosulous, 9 mm. long, 6 mm. wide. Aril very minute, corneous, ca. 0.5 mm. long. — Brandeg. Proc. Calif. Acad. Sci. II. ser. ii. 130. t. 4 (1889); Zoe i. 4 (1890); Chod. Bull. Herb. Boiss. i. 354 (1893); Sprague! Bot. Mag. cxxxii. t. 8065 (1906). — Lower California: Sierra de la Laguna, 27 Jan. 1890, *Brandegee* 23 (G); Sierra de la Laguna, *Anthony* (K); Pescadero, 23 Oct. 1893, *Brandegee* (K), l. c., 27 Oct. 1893, *Brandegee* (G). Also specimens from the Hanbury Garden at La Mortola, 17 July 1905 (K: type of Bot. Mag. t. 8065).

" In southern California said to grow to 15 feet or more in height and to be valuable economically as its young branches contain a very strong fiber and the pea-sized brown seeds which are plentifully produced yield as much as 38 per cent of excellent oil. The root has the same properties in a higher percentage " as *P. Senega* L.

78. P. hondurana Chod. Stem woody, corymbosely branched above, 4 dm. long, from a moniliform root; branches nodose, slender, 1–2 dm. long, thinly pubescent. Leaves ovate-lanceolate, apiculate, thin, the midnerve impressed beneath, 5–10 cm. long, 1.6–3.8 cm. wide, on petioles 2.5–4 mm. long, puberulous. Racemes few-flowered, 1.5–2 cm. long, the rachis pubescent; bracts caducous, linear-filiform, 1.5–2 mm. long; pedicels at length 6 mm. long, thinly pubescent. Flowers 7–8 mm. long, about 5–8. Sepals ovate, shortly ciliate, eglandulose, many-nerved. Wings not ciliate, ovate-orbicular, nervose, conspicuously longer than corolla. Keel shortly unguiculate. Upper petals cuneate, retuse at apex, about half as long as keel. Lateral petals squamiform. Capsule elliptic, deeply

cordate-emarginate with narrow sinus, 6 mm. long, 6.5 mm. wide. Seed shortly ellipsoid, tomentose, umbonate at base. Aril about half as long as seed. — Chod. Bot. Jahrb. lii. Beibl. 115. 75 (1914), as *P. honduranum.* — Based by Chodat on *Rothschuh* 616, from Cuesta del Monte grande, Dept. Matagalpa, Nicaragua, and *Niederlein* sine num., 455–610 m., between Meambar and Puente de los Altos de Santa Cruz, Honduras. — Not seen; description compiled.

79. P. **tonsa,** sp. nov. Fruticosa ramosa basi invisa. Caulis viridis tenuis ut inflorescentia subsparse minutissime incurvo-puberulus. Folia ovata vel ovato-lanceolata acuminata mucronulata basi cuneata chartacea non reticulata (venis lateralibus ca. 7-jugis) supra viridia juventate sparse minute appresso-puberula aetate glabra subtus ad costam sparsissime strigillosa demum glabrata margine paullulum revoluto ciliolato albido-punctata 7–10 cm. longa 2.1–3.5 cm. lata, in petiolis sparse incurvo-puberulis 3–4 mm. longis. Racemi extra-axillares 2 cm. longi, pedicellis 5–6 mm. longis. Sepala ovalia sparse glandulari-ciliolata dorso subglabra sed glanduloso-adspersa 2.5–3.5 mm. longa. Alae orbiculares viridescentes apice rotundatae basi breviter unguiculatae glabrae eciliolatae 7.5 mm. longae 7.5 mm. latae. Carina viridescens 6.5 mm. longa. Petala superiora obovata 4.5 mm. longa. Capsula quadrato-elliptica basi breviter stipata glabra eciliolata alata emarginata 6.5 mm. longa 5.8 mm. lata. Semen (arillo excluso) ellipsoideum pilosum 3 mm. diametro paullulum complanatum. Arillus 2 mm. altus coriaceo-carnosus in lateribus plus minusve pilosus. — GUATEMALA: La Vega, Dept. Santa Rosa, 1525 m., Sept. 1893, *Heyde & Lux* 3067 (TYPE COLL.: GK). Distributed as *P. monninoides* HBK. — T. 2. FIG. 40.

Sect. 2. **Adenotricha,** sect. nov. Sepala saepissime plus minusve glandulari-ciliata; flores mediocres vel parvi alis 2–5.3 mm. latis; herbae annuae vel perennes foliis parvis vel mediocribus linearibus vel oblongis vel ellipticis sessilibus vel brevipetiolatis. Species typica *P. grandiflora* Walt.

a. Sepals without pedicellate glands, *b.*
  b. Plant glabrous or nearly so, *c.*
    c. Leaves linear or linear-lanceolate; wings not reticulate. 82. *P. cubensis.*
    c. Leaves obovate-oblong or elliptic-oblong; wings reticulate. 80. *P. Krugii.*
  b. Plant pubescent. . . . . 83. *P. Wrightii.*

a. Sepals bearing pedicellate glands, *d.*
d. Plant glabrous or nearly so, *e.*
e. Sepals 1.1–1.3 mm. long; wings scarcely reticulate . . . 82. *P. cubensis.*
e. Sepals 2–2.3 mm. long; wings reticulate-venose . . . 81. *P. bahamensis.*
d. Plant pubescent, *f.*
f. Leaves elliptic, about 1 cm. wide . . . . . 88. *P. Planellasi.*
f. Leaves narrower, *g.*
g. Alae broadly orbicular, very strongly veined . . . . 84. *P. grandiflora.*
g. Alae obovate to oval, not strongly veined, *h.*
h. Alae obovate-spatulate; stems much branched from base . . . . . 86. *P. nicaraguensis.*
h. Alae obovate or oval; stems sparsely branched, *i.*
i. Leaves linear to lanceolate . . . . . 85. *P. angustifolia.*
i. Leaves ovate-lanceolate . . . . . 87. *P. collina.*

80. P. Krugii Chod. Annual, simple or branched, glabrous, 3 dm. high. Leaves obovate-oblong or oblong-elliptic, obtuse, cuneate at base, glabrous, 15 mm. long, 4–5 mm. wide, or smaller, short-petioled. Racemes terminal, 2 cm. long or more, loosely flowered. Flowers probably purplish, pendulous, 4 mm. long, on glabrous pedicels 0.5–1.5 mm. long. Sepals elliptic, obtuse, ciliate with eglandular hairs. Wings broadly orbicular, broader than long, not emarginate or angled, glabrous, short-clawed, the nerves anastomosing. Upper petals with broadly spatulate rounded limb. Capsule unknown. — Monog. ii. 63. t. 15. f. 37–38 (1893). — Not seen; based by Chodat on *Eggers* 4450, from New Providence, Bahamas.

81. P. **bahamensis** sp. nov. Annua erecta e radice tenui 2.3–2.9 dm. alta supra sparse vel valde ramosa. Caulis tenuis purpurascens hinc inde sparsissime strigillosus ceterum glaber, ramis divergentibus vel erectis. Folia media et superiora linearia obtusiuscula vel acutiuscula mucronulata basi acuta paullum revoluta glaberrima vel juventate sparsissime incurvo-puberula 1-nervia (nerva supra impressa subtus prominente, nervis lateralibus ca. 3-jugis inconspicuis) 2–3.5 cm. longa 2–4 mm. lata, in petiolis 1 mm. longis; folia inferiora minora ceterum similia. Racemi terminales et quasi extra-axillares 1.5–3 cm. longi 15–18-flori. Flores 3.5–4 mm. longi. Sepala oblongo-ovata obtusa anguste subscarioso-marginata sparse ciliolata et in margine glandulis ca. 5-jugis pedicellatis praedita 2–2.3 mm. longa. Alae late orbiculares apice emarginulatae basi abrupte breviterque unguiculatae valde nervosae (nervis ca. 5-jugis anastomantibus) 4 mm. longae lataeque, viridescentes purpureo-suffusae. Carina 4 mm. longa. Petala superiora cuneato-obovata apice paullulum undulata venosa ad 3 mm. longa. Fructus

deest. — BAHAMAS: New Providence: sandy loam, pine region, about 13.5 km. S. W. of Nassau, 12 Apr. 1905, *A. E. Wight* 272 (TYPE: G); Andros: Red Bays, 15 Apr. 1890, *J. I. & A. R. Northrop* 465 (GK).

82. P. CUBENSIS Chod. Very slender annual, slightly branched above, 4.5 dm. high, from a slender vertical root. Stem and branches terete, glabrous like the inflorescence, the branches in youth sparsely incurved-pubescent. Leaves linear or linear-lanceolate, obtuse, mucronate, at base acuminate, slightly revolute, with about 3 pairs of faint lateral nerves, green and glabrous both sides (when young slightly incurved-puberulous), 1.4–2.5 cm. long, 1–3.5 mm. wide, on glabrous or sparsely incurved-puberulous petioles 1 mm. long. Racemes laxly flowered, 6–12 cm. long. Sepals herbaceous, with narrow pale margin, usually bearing 3–4 pairs of pedicelled glands, 1.1–1.3 mm. long. Wings obovate-oval, rather abruptly short-clawed, truncate-rounded at apex, purplish-tinged, glabrous, not venose (at least when young), 3.5 mm. long, 2 mm. wide. Keel with short flabelliform crenulate lateral lobes, 4 mm. long. Upper petals purple, obovate. Capsule oval-oblong, glabrous, 4.4 mm. long, 2 mm. wide. Seed short-silky-pilose, 2.6 mm. long. Aril crustaceous, sparsely pilose on the sides, 0.8 mm. long, shaped like those of others in this section. — Chod.! Monog. ii. 62. t. 15. f. 36 (1893). — CUBA: 1860–64, *Wright* 112 p. p. (TYPE COLL.: BG). — Chodat describes the sepals in his types as ciliate but not glandular. In the specimens above described, which were distributed under the same number and agree in other features with his description, they are glandular-ciliate. Without much more material of this group than is at present available a satisfactory understanding of its species can scarcely be attained.

83. P. WRIGHTII Chod. Erect perennial, branched from near the base, the stems or branches about 4, erect, 3 dm. high, densely griseous-pubescent with incurved hairs. Leaves linear, acuminate at each end, mucronulate, slightly revolute, 1-nerved, the lateral veins very obscure, glabrous above except for a few hairs near the margin, subsparsely incurved-puberulous beneath, 2–3.3 cm. long, 1.5–2 mm. wide, on incurved-puberulous petioles 1 mm. or less long. Racemes at length loosely flowered and 10–13 cm. long. Flowers mauve-purple. Sepals rather densely ciliate with eglandular hairs, ovate, acute, the two lower united for 3/4 their length,

1.8 mm. long. Wings cuneate-orbicular, somewhat venose, broadly rounded at apex, rather abruptly short-clawed, 3.5 mm. long, 2.8 mm. wide. Keel 3.8 mm. long, mauve-purple with yellow apex. Upper petals obovate, 2.8 mm. long. Capsule oval, ca. 2.5 mm. long. Mature seed not seen. — Chod.! Monog. ii. 67. t. 13. f. 8–9 (1893). — CUBA: eastern part, 1856–57, *Wright* 112 p. p. (TYPE COLL.: K). — The specimen of this number in hb. Kew. agrees essentially with Chodat's description of *P. Wrightii*, except that the flowers are larger (not " 2 mm. vel paullo longiores ") and the wings by no means " duplo fere longiores quam latae." Without seeing Chodat's actual types (hb. Krug and Urban) I do not venture to base another name on this number of Wright's, which includes also *P. cubensis* Chod. (type), *P. grandiflora* var. *leptophylla* Chod., and *P. angustifolia* HBK. — that is, all the Cuban forms of immediate relationship.

84. P. GRANDIFLORA Walt. var. LEPTOPHYLLA Chod. Perennial, erectish or ascending, branched, the branches divergent or erect, 1–3.5 dm. high, rather densely incurved- or incurved-spreading-pubescent. Upper leaves linear or linear-lanceolate, the lower narrowly oblong, lance-oblong, or -oval, acutish to obtusish, mucronulate, cuneate at base, slightly revolute, 1-nerved, the lateral veins about 2 pairs or obsolete, sparsely pubescent with incurved hairs, the upper 1.5–2.1 cm. long, 2–4.5 mm. wide, the lower 7–17 mm. long, 2–8.6 mm. wide, on incurved-puberulent petioles 1 mm. long. Racemes terminal and quasi extra-axillary, 1.5–3.8 cm. long, 8–23-flowered. Flowers 3.5–3.8 mm. long. Sepals ovate, obtuse, ciliolate, bearing usually about 4 pairs of glands, 1.5–2.3 mm. long. Wings purplish-pink, broadly orbicular, inequilateral, emarginate at the rounded apex, shortly abruptly clawed, strongly reticulate-venose especially in fruit, 5 mm. long, 5.3 mm. wide. Keel 4.7 mm. long, whitish (?) with yellow apex. Upper petals purplish, broadly oval-obovate, slightly undulate at the rounded apex, 4 mm. long. Capsule oval, emarginate, 3.5 mm. long, 2.5 mm. wide. Seed shortly silky-pilose, 2.7 mm. long. Aril corneous, 1 mm. long, sparsely pubescent, very shortly 3-lobed at base. — Chod.! Monog. ii. 57 (1893). — Mexico without locality: *Schiede & Deppe* (G). CUBA: *Wright* 112 p. p. (COTYPE COLL.: G). SANTO DOMINGO: in savannas, Sierra de Palo Quemado, 500 m., 10 May 1887, *Eggers* 1890 (COTYPE COLL.: BK); near Constanza, 1190 m., May 1910,

Tuerckheim 3247 (BG); Arroyo Seco, 300 m., Prov. Barahona, Apr. 1912, *Fuertes* 1557 (BG); Cuesta de Piedro, 250 m., 6 June 1887, *Eggers* 2364 (K). — *Linden* 1704 (BK), placed here by Chodat, has wings 3 mm. long, 2.5 mm. wide, and is very doubtfully referable to this species. — Close to *P. grandiflora* var. *angustifolia* T. & G., Fl. N. Am. i. 671 (1840), which has even narrower nearly glabrous leaves and perhaps larger flowers.

Var. ORBICULARIS Chod. Leaves elliptic-lanceolate or oblong-lanceolate or linear, glabrescent or slightly puberulent, 3–4 cm. long, 3–5 mm. wide. Flowers 5 mm. long. Lower sepals (united) eglandular or with 2 pedicellate glands on each margin; the upper glandular-ciliate. Wings with limb often broader than long, subflabellate, subretuse. — Chod. Monog. ii. 57 (1893). — Not seen; based on specimens from savannas near San Carlon Generale (*Preneloup* 1004), and grassy places in calcareous soil near Cuesta de Piedro, Santiago, San Domingo.

85. P. ANGUSTIFOLIA HBK. Annual, subsimple or rather strongly branched, 9–33 cm. high, more or less densely incurved- or loosely spreading-incurved-pubescent or even substrigose. Leaves linear to lanceolate, acuminate to the sometimes bluntish apex, mucronulate, acute to acuminate at base, subglabrous or sparsely incurved-pubescent, 1-nerved, the lateral nerves 3–6 pairs or obsolete, 1.3–4.5 cm. long, 2–9 mm. wide, on petioles 1–1.5 mm. long; lower leaves smaller. Racemes 6–33-flowered, 1.5–7 cm. long. Flowers 3–4 mm. long. Sepals oblong-ovate, obtuse, sparsely ciliate at tip, with 2–3 pairs of pedicellate glands, 1.5–1.8 mm. long. Wings strongly inequilateral, broadly wedge-obovate, cuneate at base, retuse at apex, veiny but not strongly reticulate-veined even in fruit, 3–4 mm. long, 2.7–3 mm. wide, pinkish-purple. Keel 3.8 mm. long. Upper petals mauve-purplish, suborbicular-obovate, rather strongly veined, retuse at apex, 3 mm. long. Capsule oblong-oval, emarginate, plumpish, 2.8–3 mm. long, 1.7 mm. wide. Seeds as in *P. grandiflora* var. *leptophylla* but smaller (seed 2.5 mm. long, aril 0.7 mm. long). — HBK. Nov. Gen. v. 405. t. 511 (1821); Chod. Monog. ii. 52. t. 15. f. 22–24 (1893). *P. bryzoides* St. Hil. Fl. Bras. Merid. ii. 44. t. 88 (1829). *P. mucronata* MacFad. Fl. Jam. i. 47 (1837), not Willd. (err. iden.). *P. americana* Mill. δ. *angustifolia* (HBK.) Ktze. Rev. i. 48 (1891). — VERA CRUZ: Mirador, Nov. 1838, *Linden* 175 (K). MICHOACAN: La Baranca, 500 m., 3 Sept.

1898, *Langlassé* 316 (G). Tabasco: Atasta, 30 Aug. 1889, *Rovirosa* 602 (K). Mexico without locality: *Pavon* (B). Guatemala: Mazatensugo, Nov. 1870, *Bernoulli & Cario* 3191 (K); between Jocoy (?) and San Geronimo, Aug. 1870, *Bernoulli* 998 (K); Santa Rosa, 915 m., July 1892, *Heyde & Lux* 3007 (K). Cuba: *Wright* 112 p. p. (G); Cieneguita, 18 June 1895, *Combs* 213 (GK). Jamaica: St. Andrew, *McNab* (K); Kings House Grounds, 25 Nov. 1897, *Harris* 6904 (BJ); Hope Gardens, 215 m., 2 Sept. 1901, *Harris* 8153 (J). St. Thomas: Cowells Hill, 8 Dec. 1876, *Eggers* (G). Grenada: Mardigras, St. Georges, 14 Aug. 1905, *Broadway* 1818 (G). Tobago: Scarboro, 29 Sept. 1912, *Broadway* 4252 (B). Trinidad: *B. de Schack* (K); *Crueger* (K); *Lockhart* (K); *Fendler* 271 (K); Queens Park, 1848, *Purdie* 36 (K). — T. 2. Fig. 45.

86. P. nicaraguensis Chod. Stems hispid with spreading hairs, striate, leafy, bearing many short (3–5 cm.) ascending leafy flowering branches near the base. Leaves lanceolate or lance-linear, mucronate, usually glabrescent or sparsely puberulous, 3–4.5 cm. long, 4–5 mm. wide. Racemes terminal and extra-axillary, loosely few-flowered, 1.5–4 cm. long. Flowers 4 mm. long. Sepals glandular-ciliate. Wings obovate-spatulate, not angulate, subemarginate, inequilateral, not ciliate. Upper petals cuneate at base, suborbicular above. Capsule short-stipitate, ovate-elliptic, emarginate, 2.5 mm. long and wide. Seed ovoid, golden-sericeous. Aril small. — Monog. ii. 54 (1893). — Not seen; described by Chodat from *Levy* 238, Nicaragua (hb. Boiss.), with which *Pittier & Durand* 348, from Costa Rica, was doubtfully associated.

87. P. collina Brandegee. Perennial, the stems 3 dm. long, pubescent, sparsely branched. Leaves ovate-lanceolate, attenuate at base into a short petiole, puberulent, 3–4 cm. long, 7 mm. wide, the lower much smaller. Racemes axillary or extra-axillary. Flowers 4 mm. long. Upper sepal glandular-ciliate. Wings obovate, inequilateral, shorter than capsule, 4 mm. long. Keel yellowish-white. Upper petals purple. Capsule elliptic-oblong. Seed cylindric, appressed-hairy. Aril large, curved, 2-horned, white. — Brandegee, Zoe v. 204 (1905). — Described from Cerro Colorado, Sinaloa. Not seen; description compiled.

88. P. Planellasi Molt. & Gomez. Herbaceous perennial (?), erect, sparsely branched, 3.5 dm. high, the stem and branches rather densely pubescent with incurved or incurved-spreading hairs,

a few longer subspreading hairs intermixed. Leaves elliptic, subacute to obtuse, barely mucronulate, cuneate at base, sparsely incurved-pubescent beneath, subglabrous above, the ca. 6 pairs of lateral nerves fairly prominent, 1.8–2.7 cm. long, 8–11 mm. wide, on petioles 1.5–2 mm. long. Racemes 15–45-flowered, 4–7 cm. long. Flowers 4.5–5 mm. long. Sepals lance-oblong, obtuse, slightly involute, with 2–3 hairs at apex and 2–3 pairs of pedicellate glands on margin, otherwise glabrous, 2–2.4 mm. long. Wings broadly inequilaterally wedge-obovate, cuneate at base, slightly undulate at the rounded apex, only slightly veiny, 5 mm. long, 3.5 mm. wide. Keel 4.3 mm. long. Upper petals with orbicular dilated apex, 3.9 mm. long. Capsule oblong, emarginate, cuneate at base, 4.5 mm. long, 1.8 mm. wide. Seed shortly silky-pilose, 3.2 mm. long. Aril 0.9 mm. long, pubescent. — Molt. & Gomez in Gomez, Anal. Hist. Nat. Madrid xix. 233 (1890). *P. peduncularis* A. Rich. Fl. Cub. ii. 37. t. 12 bis (1853), not Burch. ex DC. Prod. i. 323 (1824). — GUADELOUPE: 1892, *Père Duss* 2981 (G). — The species is apparently the same as that to which the name *P. violacea* Aubl., clearly described and figured as with a cristate keel, is most unaccountably referred by Chodat. — T. 2. FIG. 46.

Subgenus V. **CHAMAEBUXUS** (DC.), comb. nov.

Sepals herbaceous, free, the upper usually persistent, all persistent in one species. Wings petaloid, oblong, deciduous (persistent in one species). Keel oblong, gibbous toward apex, with distinct cylindric or conic infra-apical rostrum, not otherwise crested. Upper petals oblong, united below to the staminal tube. Stamens monadelphous, united for more than half their length, glabrous. Stigmatic lobes subapproximate, the upper tufted, the lower obliquely elevated, not tufted. Capsule small or medium, scarcely winged, membranous-herbaceous. Seeds pubescent. Aril generally 2-lobed and appressed, sometimes rostrate. — *Polygala* L. sect. *Chamaebuxus* DC. Prod. i. 331 (1824); Chod. Arch. Sci. Phys. Nat. Genève xxv. 698 (1891); Monog. ii. 93 (1893). *Chamaebuxus* Spach, Hist. Nat. Veg. vii. 125 (1839). — The species here described, with a few others from the southwestern United States, form a most distinct section which may be called, in allusion to its beaked keel,

Sect. **Rhinotropis,** sect. nov. Carina infra apicem obtuse cylindrico- vel conico-rostrata. Species typica *P. Lindheimeri* Gray. — This divides naturally into two subsections.

Sepals (except generally the upper) and wings deciduous.
Subsect. A. EURHINOTROPIS
Sepals and wings persistent.....Subsect. B. PANTOMONE, p. 77.

Subsect. A. **Eurhinotropis,** subsect. nov. Sepalum superius saepissime persistens, sepala inferiora ut alae decidua. Species typica *P. Lindheimeri* Gray.

a. Plant practically glabrous, or very sparsely and minutely strigillose; leaves oblong or lance-oblong, rounded at apex, not mucronate or reticulate.....89. *P. Fishiae.*
a. Plant pubescent; leaves acute (when obtuse cuspidate or mucronate), more or less reticulate, *b.*
  b. Leaves oval, *c.*
    c. Leaves glabrous, 4–9 mm. long.....91. *P. eucosma.*
    c. Leaves usually incurved-puberulous, larger, *d.*
      d. Keel 5.5 mm. long.....90. *P. nitida.*
      d. Keel 4.2 mm. long.....91.1. *P. Emoryi.*
  b. Leaves (at least the upper) lanceolate or squamiform to linear, *e.*
    e. Hairs of stem and leaves widely spreading.....92. *P. Lindheimeri.*
    e. Hairs shorter, incurved or appressed, *f.*
      f. Leaves normal, linear to lanceolate, *g.*
        g. Leaves (except the lowest) linear, *h.*
          h. Racemes 3–6-jointed; flowers 4 mm. long...94.2. *P. Tweedyi.*
          h. Racemes 8–15-jointed; flowers 5.5 mm. long.
93. *P. blepharotropis.*
        g. Leaves (except the lower) lanceolate to linear-lanceolate, *i.*
          i. Raceme-axis 10–20-jointed.....93.1. *P. texensis.*
          i. Raceme-axis 2–8-jointed, *j.*
            j. Aril 1.2 mm. deep.....94.1. *P. arizonae.*
            j. Aril (1.6) 2–2.2 mm. deep.....94. *P. lithophila.*
      f. Leaves squamiform.....95. *P. nudata*

89. P. FISHIAE Parry. Frutescent, branching, 1–1.6 m. high, the stem and branches woody, green, glabrous or very minutely and sparsely strigillose. Leaves narrowly oblong or oblong-lanceolate, rounded or retuse at the slightly mucronulate apex, cuneate to rounded at base, glabrous, with about 10 pairs of lateral nerves, not reticulate, 1.7–5 cm. long, 4–14 mm. wide, on petioles 1.5–2 mm. long, slightly strigillose on the upper side. Racemes terminating stem and branches, 2.5– (at length) 20 cm. long, 6–35-flowered, not flexuose. Flowers 8.5 mm. long, purplish, whitish, and yellowish, the lower subtended by oval leaf-like bracts about 7 mm. long; pedicels 8–11.5 mm. long in fruit. Upper sepal elliptic, obtuse, somewhat inflated, densely ciliolate, otherwise glabrous, 2.8–3.5

mm. long, not persistent in fruit, the lower similar, 2.6–3.3 mm. long. Wings purplish (fide Davidson), obovate, rounded at apex, cuneate at base, finely ciliolate but otherwise glabrous, finely reticulate-veined, 8.5 mm. long, 4.2 mm. wide. Keel yellow (fide Davidson), 8 mm. long, its beak short, curved, 0.7 mm. long. Upper petals oblong, slightly retuse at apex, porrect, 8 mm. long. Capsule suborbicular, obliquely rounded at base, emarginulate at the slightly narrowed apex, 7.5 mm. long, 8.5 mm. wide. Seed 5 mm. long, pilose. Aril 4 mm. long; corneous umbo conic, obtuse, loosely pilose, 3 mm. long; scarious border 1 mm. deep, loose, irregularly dentate-lobulate. — Parry! Proc. Davenp. Acad. Nat. Sci. iv. 39 (1884); (*P. Fischiae*) Chod. Bull. Herb. Boiss. iv. 898 (1896), where referred to *P. californica* Nutt. — LOWER CALIFORNIA: near Sauzal, Todos Santos Bay, 1882, *Miss Fanny E. Fish* (TYPE COLL.: GK); near Todos Santos Bay, 30 Sept. 1884, *Orcutt* 1223 (G). Also CALIFORNIA: Santa Anita Canyon, Los Angeles Co., Sept. 1883, *Nevin* 849 (G); Sierra Madre Range, Los Angeles Co., July 1893, *Davidson* (G). — T. 2. FIG. 52.

90. P. NITIDA Brandegee. Frutescent, branching, decumbent, the stem and branches finely incurved-puberulous, 9–20 cm. long. Lower leaves elliptic, cuspidate at the rounded apex, cuneate-rounded at base, reticulate (lateral veins ca. 4 pairs), shining, glabrous or very sparsely incurved-puberulous on midnerve beneath, 1–2 cm. long, 7.5–12.5 mm. wide, on petioles 1 mm. long, the lowest similar but smaller, the upper gradually more oblong or obovate-oblong, 11–15 mm. long, 4–5 mm. wide. Racemes extra-axillary, 3–9-flowered, 1.5–3.5 cm. long, the axis slightly geniculate, the bracts and much smaller bractlets persistent, minute, lance-subulate, sparsely ciliolate. Flowers rose-color, 5.5 mm. long. Upper sepal ovate, obtusish, sparsely ciliolate, persistent, 3 mm. long; the lower sepals oblong, acutish, slightly oblique, rosy-tinged, sparsely ciliolate, 2.6 mm. long. Wings rose-color, oblong-obovate, acutish at the mucronulate apex, cuneate at base, veiny (the veins ending free), glabrous, 5.5 mm. long, 3.3 mm. wide. Keel yellowish, saccate near middle, 5.5 mm. long, the blunt slightly descending beak 1.5 mm. long. Upper petals oblong, rounded at apex, 4.5 mm. long. Capsule oval, emarginate, slightly stipitate, obliquely subreticulate-striate, sparsely incurved-puberulous especially along septum, 4 mm. long, 2.7 mm. wide. Seed pilosulous, 3 mm. long. Aril

1.9–2.1 mm. deep, the small corneous umbo appressed, glabrous, the 2 corneous-scarious lobes narrowly oblong-obovate, rounded at apex, appressed, 1.8 mm. long. — Brandeg.! Univ. Calif. Pub. Bot. iv. 272 (1912). — San Luis Potosi: Bagre, Minas de San Rafael, May 1911, *Purpus* 5168 (type coll.: BG). — T. 2. Fig. 49. — Brandegee's description of the stem as 1 m. long is perhaps a misprint for 1 dm.

91. P. **eucosma,** sp. nov. Fruticulosa sparse ramosa procumbens 2 dm. longa et ultra, caulibus viridibus foliosis minute incurvo-puberulis. Folia ovalia obtusa mucronata basi cuneata coriacea dense reticulata glaberrima 4–9 mm. longa 2–6.5 mm. lata brevissime petiolata. Flores 4.5 mm. longi, ut videtur rosei. Racemi pauci 2–3-flori ad 7 mm. longi. Sepalum superius ovali-ovatum acutiusculum subsparse ciliolatum ceterum glabrum 3 mm. longum; inferiora oblongo-ovalia aequilonga. Alae obliquae obovatae basi cuneate apice obtusae minute retusae glabrae 4.5 mm. longae 2.3 mm. latae nervis liberis. Carina in medio saccata ad 4.3 mm. longa, rostro obtuso descendente 0.7 mm. longo. Petala superiora oblonga ad 3.8 mm. longa. Fructus deest. — Coahuila: Sierra Madre, 64 km. south of Saltillo, Mar. 1880, *Palmer* 2143 (type coll.: GK). — Distributed and recorded by Watson (Proc. Am. Acad. xvii. 324 (1882)) as *P. Lindheimeri* Gray.

91. 1. P. **Emoryi,** sp. nov. Fruticulosa ramosa 1.8 dm. longa et ultra basi invisa. Caulis tenuis dense puberulus pilis incurvato-patentibus. Folia ovalia obtusa valde mucronulata basi rotundata coriacea reticulata (nervis lateralibus 2–3-jugis) subsparse puberula pilis incurvo-patentibus 6–16 mm. longa 5–11 mm. lata, in petiolis similiter puberulis 1–1.5 mm. longis. Racemi extra-axillares 2–6-flori 1.7–2.7 cm. longi. Sepalum superius ovatum acutum 2.8 mm. longum, inferiora oblonga acuta 2 mm. longa; omnia sparse puberula et sparsissime ciliata pilis incurvo-patentibus. Alae oblongae carinam subaequantia vix bene visae. Carina 4.2 mm. longa, rostro cylindrico 1.1 mm. longo. Fructus deest. — Texas (?): valley of the Rio Grande, *Mexican Boundary Survey under Emory* 190 p. p. (type: K). — Apparently distinct from *P. Lindheimeri* in leaf form and pubescence, but possibly grading into that species; the Kew material is mixed with it.

92. P. Lindheimeri Gray. Stems several from a fruticulose base, erectish to decumbent, green, densely pilose with rather short

wide-spreading hairs. Lower leaves elliptic to orbicular, mucronate at the obtuse to rounded apex, rounded to cuneate at base, strongly reticulate, thinnish, spreading-pilosulous above and (chiefly along veins) beneath, 5–13 mm. long, 3–12 mm. wide, on petioles 1 mm. long; middle and upper similar but gradually passing to oblong or lance-oblong, acute at each end, the uppermost bractlike, much reduced. Racemes contra-axial, strongly geniculate, 2–8-flowered, pubescent like the stem, 1–3.5 cm. long. Flowers 5 mm. long, their pedicels spreading-pilose, 1–2 mm. long. Upper sepal persistent, ovate, acute, spreading-pilosulous and -ciliate, narrow-margined, 3–3.2 mm. long; lower similar, 2 mm. long. Wings oblong-obovate, barely retuse at the rounded apex, cuneate at the oblique base, spreading-pilosulous, 4.8–5 mm. long, 2.3 mm. wide. Keel 4.8 mm. long, its porrect beak 0.6 mm. long. Upper petals oblong, entire, slightly oblique at apex, 4.4 mm. long. Capsule oblong, emarginulate, scarcely stipitate, spreading-pilosulous, striate, 4.8 mm. long, 2.4 mm. wide. Seed silky-pilose, 3.2–3.5 mm. long. Aril 1.8 mm. deep, entirely corneous; umbo 0.4 mm. deep, with indistinct appressed dorsal and oblong entire appressed (1.4 mm. long) lateral lobes. — Gray! Pl. Lindh. ii. (Bost. Journ. Nat. Hist. vii.) 150 (1850); Pl. Wright. i. 39 (1852); Chod. Monog. ii. 107. t. 18. f. 10–12 (1893); Rob. in Gray, Syn. Fl. i. pt. 1. 451 (1897). — Nuevo Leon: Monterey, *Eaton & Edwards* 53 (K). Also Texas: *Lindheimer* III. 333 p. p. (type coll.: BG); *Lindheimer* IV. 333 p. p. (K); *Wright* 73 (K), 102 (BGK), 1349 (BGK); *Reverchon* 63 (G); *Groth* 153 (G); *Havard* 100 (G); *E. Hall* 96 (K); *Mexican Boundary Survey under Emory* 190 p.p. (K). — T. 2. Fig. 50.

93. P. **blepharotropis,** sp. nov. Basis. . . . Caules fruticulosi ramosi verosim. procumbentes virides vix glaucescentes incurvo-puberuli 1.7–2.8 dm. longi. Folia ima lanceolata vel obovata 4–7 mm. longa 1–1.3 mm. lata; media et superiora linearia utroque acuminata mucronulata paullum reticulata incurvo-puberula 9–16 mm. longa 1–2 mm. lata, in petiolis 0.6 mm. longis. Racemi (cum bene evoluti) valde geniculati 8–15-nodati 1.5–3 cm. longi, interdum solummodo (ut videtur) 4–8-nodati. Flores pallidi 5.5 mm. longi. Sepalum superius ovatum acuminatum incurvo-puberulum et ciliolatum 2.8 mm. longum, inferiora similia angustiora obtusiuscula 2.4 mm. longa. Alae oblique obovatae basi cuneatae apice

suboblique rotundatae basi et apice sparsissime puberulae 5 mm. longae 2.3 mm. latae. Carina 5 mm. longa subdense incurvo-puberula (unguiculo excepto), rostro cylindrico obtuso adscendente 0.8 mm. longo. Petala superiora obovata ad apicem paullum dilatata apice oblique rotundata vix retusa 3.8 mm. longa. Capsula submatura ovalis basi cuneata apice vix emarginulata incurvo-puberula 3.6 mm. longa 2 mm. lata. Semen (immaturum) breviter sericeum 2.8 mm. longum. Arillus (submaturus) 1.6 mm. altus glaber, umbone ad 0.3 mm. alto, lobis 2 lateralibus ad 1.3 mm. longis supra albidis corneis infra medium subscariosis. — SONORA: Babocomori, Sept. 1851, *Thurber* 1090 (TYPE: G). — T. 2. FIG. 51.

93.1. P. TEXENSIS Rob. Suffruticulose, the stems several from a thick simple or branched woody root, erect or ascending, green, sparsely or subdensely puberulous with strongly incurved hairs, 1.2–2.8 dm. high. Lower leaves oval, mucronulate, rounded at apex, cuneate at base, coriaceous, reticulate, sparsely puberulous chiefly on midnerve beneath and margin with strongly incurved hairs, 8.5–12 mm. long, 4.5–6 mm. wide; middle and upper similar but narrowly lanceolate or lance-linear, acute or acuminate at each end, slightly revolute, 1.4–2.1 cm. long, 1.6–4 mm. wide, on petioles 1 mm. or less long. Racemes normally 10–20-jointed, strongly zigzag, (1.8) 3.5–6 cm. long. Upper sepal ovate-oblong, acute, 3.2 mm. long, the lower oblong, acute, 2.6 mm. long, all more or less ciliolate and incurved-puberulous. Wings oblong, obtuse, sparsely incurved-puberulous along midline, 5–5.3 mm. long, 2 mm. wide. Keel 5 mm. long, the blunt rostrum 1.4 mm. long. Upper petals oblong, obliquely 1-dentate at end, 4.7 mm. long. Capsule (submature) oval, subdensely puberulous, 4.2 mm. long, 2.8 mm. wide. Seed (immature) sericeous, 2.7 mm. long. Aril 1.7 mm. long, the two lateral lobes linear, appressed. — Rob.! in Gray, Syn. Fl. i. pt. 1. 451 (1897). — TEXAS: 1846, *Lindheimer* III. 333 p. p. (GK); 1847–48, *Lindheimer* IV. 333 p. p. (K); rocky places, Upper Guadaloupe, July 1845, *Lindheimer* 337 (TYPE COLL.: G); Comanche, 8 Aug. 1877, *Reverchon* 708 (G).

94. P. **lithophila,** sp. nov. Caules plures e basi fruticulosa erecti vel patentes ramosi foliosi incurvo-puberuli 7–15 cm. longi. Folia media lanceolata vel oblonga acuta vel acuminata mucronata basi cuneata ad acuminata coriacea subreticulata sparsissime vel dense incurvo-puberula 2–11.5 mm. longa 0.6–4.5 mm. lata, in petiolis ad

0.6 mm. longis; suprema interdum linearia 11–13 mm. longa 1–1.3 mm. lata; ima ovalia vel obovata minora. Racemi terminales et extra-axillares 2–6-flori plus minusve geniculati 0.5–2.3 cm. longi. Flores ut videtur albido-lutescentes 5 mm. longi. Sepalum superius persistens ovatum acutiusculum anguste albido-marginatum incurvo-puberulum et -ciliolatum 2.4 mm. longum; inferiora similia obtusa 1.9 mm. longa. Alae obovatae apice rotundatae basi longe cuneatae glabrae 5 mm. longae 2.2 mm. latae. Carina 5.3 mm. longa, rostro obtuso porrecto 0.7 mm. longo. Petala superiora oblonga apice oblique 1-dentata 4.6 mm. longa. Capsula oblonga basi obliqua vix stipata apice emarginulata striata incurvo-puberula aetate subglabrata 3.8–4.5 mm. longa 2.1–2.7 mm. lata. Semen breviter sericeum 3.3–3.5 mm. longum. Arillus (1.6) 2–2.2 mm. altus glaber corneus, umbone 0.5 mm. alto, lobis lateralibus verticalibus appressis linearibus apice paullum dilatatis subdenticulatis vel integris. — COAHUILA: crevices of rocks, Sierra de Zapatero, July 1910, *Purpus* 4540 (BG); Peña, Feb. 1905, *Purpus* 1038 (G). SAN LUIS POTOSI: Minas de San Rafael, June 1911, *Purpus* 5171 (TYPE: G). Also TEXAS: Kingsville, 20 Apr. 1905, *Tracy* 9427 (G). — T. 2. FIG. 48.

94.1. P. ARIZONAE Chod. Suffruticulose, the stems very numerous, erect or ascending from a thick woody root, pale, branched, rather densely covered with fine incurved hairs, 1.2–2 dm. high. Lower leaves oval, acutish at each end, coriaceous, mucronulate, slightly reticulate, very sparsely incurved-puberulous, subsessile, 6 mm. long, 3.5 mm. wide; middle and upper similar but oblong- or linear-lanceolate, acute at each end, 6–12 mm. long, 1–3 mm. wide. Racemes 2–8-jointed, very zigzag, 0.5–3.5 cm. long. Flowers apparently rose-color (?). Upper sepal ovate-lanceolate, obtusish, subglabrous, 2.8 mm. long; lower sepals oblong, obtuse, glabrous, 1.8 mm. long. Wings oblong-obovate, obtuse, 5 mm. long, 2.3 mm. wide. Upper petals narrowly cuneate-oblong, scarcely enlarged at the obliquely emarginate apex, 4.8 mm. long. Keel 5 mm. long, the rostrum 0.7 mm. long. Capsule oval, subtruncate at apex, oblique at base, longitudinally striate-reticulate, very sparsely and finely incurved-puberulous, 4 mm. long, 2.8 mm. wide. Seed obovoid-ellipsoid, pilose, 2.9–3 mm. long. Aril small, corneous, glabrous, 1.2 mm. high, the lateral lobes oblong. — Chod.! Monog. ii. 108. t. 18. f. 13–15 (1893); Rob. in Gray, Syn. Fl. i. pt. 1. 451

(1897). — Arizona: limestone ledges, foothills of the Santa Rita Mts., 25 June 1884, *Pringle* (cotype coll.: GK). — T. 2. Fig. 47.

94. 2. P. Tweedyi Britton. Stems numerous, often very crowded, erectish or spreading from a fruticulose base, finely incurved-puberulous, 4–19.5 cm. long. Leaves (except the lowest) linear, subacuminate at each end, mucronulate, sparsely incurved-puberulous chiefly along the slightly revolute margin, 1-nerved, 9–18 mm. long, 0.7–1.8 mm. wide, on petioles 0.5 mm. long; the lowest obovate-oblong, obtuse, mucronulate, cuneate at base, 4–12 mm. long, 1.3–4 mm. wide. Racemes extra-axillary, 1–1.3 cm. long, 3–6-flowered, straightish or slightly geniculate. Flowers 4 mm. long. Upper sepal elliptic, obtuse, incurved-puberulous, submucronulate, 2–2.3 mm. long; lower sepals 1.4 mm. long, sparsely puberulous and ciliolate. Wings obovate, rounded at apex, cuneate at base, glabrous, the veins reticulate toward midrib but free at apices, 4 mm. long, 1.8 mm. wide. Keel saccate near middle, 3.5 mm. long, its rostrum slightly descending, obtuse, 0.5 mm. long. Upper petals oblong, obliquely retuse at apex, 3.2 mm. long. Capsule oblong, barely emarginulate, scarcely stipate, obliquely striate, subsparsely or densely incurved-puberulous, 4.5 mm. long, 2.7 mm. wide. Seed subsilky-pilose, 3 mm. long. Aril as in *P. Lindheimeri*, 2 mm. high, corneous throughout, the umbo with slight anterior boss, the 2 lobes appressed, linear-oblong, slightly bifid near apex or entire, 1.5 mm. long. — Britton! in Wheelock, Mem. Torr. Club ii. 143 (1891). *P. arizonae* Chod. var. *tenuifolia* Chod.! Monog. ii. 109 (1893). — Texas: Tom Greene Co., 1879, *Tweedy* (type coll. of *P. Tweedyi*: G). Arizona: Babocomori Creek near Ft. Huachuca, May 1882, *Lemmon* 2641 (type coll. of *P. arizonae* var. *tenuifolia:* BG); southern part, 1881, *Lemmon* 497 (G). — It is possible that *Lemmon* 2641 really came from northern Sonora.

95. P. nudata Brandegee. Stems very numerous, much branched, erect from a fruticulose base, about 1.5 dm. high, green, substriate, sparsely strigillose or subglabrous. Leaves bractlike, minute, linear-lanceolate, acuminate, submucronulate, subsessile, sparsely incurved-puberulous, 1–4.5 mm. long, 0.5 mm. wide. Racemes terminating stems and branches, 4–6-flowered, straight, 2.8 cm. long or less. Flowers 4 mm. long, white. Upper sepal ovate, acute, with rather strong midnerve and broad pale margin, sparsely puberulous at tip and ciliolate, persistent, 2.7 mm. long; the

lower similar, elliptic, acutish, 2.2 mm. long. Wings oval-obovate, truncate-rounded at apex, cuneate at base, glabrous, sparsely veined, the veins free, 4 mm. long, 2.2 mm. wide. Keel saccate toward middle, 3.5 mm. long, the saccate portion greenish; rostrum blunt, 0.7 mm. long. Upper petals rather broadly oblong-obovate, unequally 2–4-lobed at apex, nearly equalling keel. Capsule oblong, glabrous or sparsely puberulous toward apex, narrowly erose-winged, 2.8 mm. long, 2 mm. wide. Seed sericeous, 2.3 mm. long. Aril 0.8 mm. long, the lateral lobes oblong, the dorsal very short, appressed. — Brandeg.! Univ. Calif. Pub. Bot. iv. 183 (1 July 1911). *P. minutifolia* Rose! Contr. U. S. Nat. Herb. xiii. 307 (11 Apr. 1911). — COAHUILA: Sierra de la Paila, Oct. 1910, *Purpus* 4762 (TYPE COLL. of *P. nudata*: BG). NUEVO LEON: dry limestone cliffs of the Sierra Madre near Monterey, 10 July 1907, *Pringle* 13949 (TYPE COLL. of *P. minutifolia*: G). — In accordance with the International Rules (Art. 36), I have felt it necessary to adopt for this species the slightly later name *P. nudata*, as being the first to be published with a Latin diagnosis.

Subsect. B. **Pantomone,** subsect. nov. Sepala ut alae persistentia. Species unica *P. desertorum* Brandegee.

96. P. DESERTORUM Brandegee. Frutescent, several–many-stemmed, 2.5 dm. high, the stems erect, subsimple or branched, sparsely strigillose. Leaves linear to linear-lanceolate, acute, mucronulate (or the lowest linear-obovate, obtuse), sparsely ciliate and appressed-pubescent, sessile, firm, with obscure lateral nerves, slightly involute, 9–18 mm. long, 1–1.5 mm. wide, the lowest and uppermost smaller. Racemes terminating stem and branches, loose, 5–9 cm. long, 5–14-flowered, straightish. Flowers 8–8.5 mm. long, purple and yellow. Upper sepal oblong-oval, obtuse, glabrous, veiny, slightly saccate at base, 7.5 mm. long; the lower elliptic, 5 mm. long; all persistent in fruit. Wings purple, oblong-obovate, glabrous, veiny, barely mucronulate at the rounded apex, appearing apiculate by the inflexing of the sides, not clawed, 8 mm. long, 3.4 mm. wide, persistent. Keel yellow, with saccate tip, 8.5 mm. long, its blunt slightly decurved beak 2.2 mm. long. Upper petals purple, porrect, ciliate below, 8.5 mm. long. Capsule oval-oblong, emarginate, very narrowly margined, scarcely striate, cuneate-stiped (stipe 1 mm. long), glabrous, 5–5.5 mm. long, 2.5–4 mm. wide. Seed subsilky-pilose, 3.3–3.5 mm. long. Aril corneous,

glabrous, 1.2 mm. deep, the umbo 0.6 mm. deep, with slightly upturned dorsal end, the lateral lobes oblong, appressed. — Brandeg. Proc. Calif. Acad. Sci. II. ser. ii. 130 (1889); Chod. Bull. Herb. Boiss. i. 355 (1893). — Lower California: San Fernando, 18 May 1889, *Brandegee* (G). — T. 2. Fig. 53.

Subgenus VI. **ORTHOPOLYGALA** (Chod.), comb. nov.

Sepals herbaceous, free, persistent. Wings petaloid, persistent. Keel bearing an infra-apical 2–many-lobed fimbriate crest. Upper petals united to staminal tube and keel below. Stigmata various. Capsule usually oval or elliptic, not or scarcely winged. Seed pubescent or rarely glabrous. Aril with usually corneous apex and two lateral appressed lobes, sometimes very minute. — *Polygala* L. sect. X. *Orthopolygala* Chod. Arch. Sci. Phys. Nat. Genève xxv. 698 (1891); Monog. ii. 120 (1893). *Polygala* sect. V. *Timutua* DC. Prod. i. 327 (1824).

a. Capsule very narrowly or not margined, both cells dehiscent ..... Sect. 1. Timutua.
b. Hairs of seed glochidiate ..... Ser. γ. Glochidiatae, p. 90.
b. Hairs of seed not glochidiate, *c.*
c. Petals joined into a slender tube more than twice as long as wings; aril rather large, cellular, equitant, not lobed ..... Ser. ζ. Incarnatae, p. 101.
c. Petals and aril otherwise, *d.*
d. Hairs long, forming a silky coma at base of the conic seed ..... Ser. δ. Trichospermae, p. 92.
d. Seed short-pubescent or rarely glabrous, *e.*
e. Flowers tiny, slender-pedicelled (except in *P. gracillima*, which has long dense very slender racemes), in long loose racemes; leaves nearly all alternate ..... Ser. ε. Tenues, p. 96.
e. Raceme very dense, thick, the wings much larger than the keel; leaves alternate or whorled. Ser. β. Timoutoideae, p. 89.
e. Raceme dense to loose, the wings never much larger than the keel; leaves in most species more or less verticillate ..... Ser. α. Galioideae.
a. Capsule with narrowly or rather broadly winged dehiscent upper cell and marginless usually indehiscent lower cell. Sect. 2. Monninopsis, p. 102.

Sect. 1. Timutua DC. (ampl.). Both cells of the marginless or narrowly margined capsule dehiscent, equal. — *Polygala* L. sect. *Timutua* DC. Prod. i. 327 (1824); *Polygala* sect. *Orthopolygala* subsect. I. Chod. Monog. ii. 123 (1893).

Ser. α. Galioideae Chod. Leaves in most species whorled at least below, sometimes all alternate; racemes dense to loose; seed

short-pubescent with straight hairs; aril with two lateral descending lobes. — *Polygala* sect. *Orthopolygala* subsect. I. A. *Galioideae* Chod. Monog. ii. 127 (1893).

a. Leaves whorled at least to middle of stem, *b.*
  b. Pedicels 1.2–1.5 mm. long ..... 100. *P. conferta.*
  b. Pedicels 1 mm. long or less, *c.*
    c. Aril nearly or quite as long as seed, *d.*
      d. Leaves fleshy, spatulate-obovate ..... 102. *P. turgida.*
      d. Leaves not fleshy nor spatulate-obovate, *e.*
        e. Sepals glandular-ciliate ..... 103. *P. aparinoides.*
        e. Sepals not glandular-ciliate ..... 105. *P. subalata.*
    c. Aril much shorter than seed, *f.*
      f. Leaves linear to linear-lanceolate, 2–4 mm. long . 97. *P. saginoides.*
      f. Leaves spatulate-obovate or rhomboidal, 4–9 mm. long, *g.*
        g. Wings obovate-oblong ..... 98. *P. spathulata.*
        g. Wings elliptic ..... 99. *P. crucianelloides.*
      f. Leaves larger, *h.*
        h. Flowers 2.5–3 mm. long (Mexico) . . 106 *β*. *P. alba* var. *suspecta.*
        h. Flowers 2 mm. long, *i.*
          i. Leaves 1.5–2.6 mm. wide; capsule 2 mm. long. 108. *P. Wightiana.*
          i. Leaves 2.7–7 mm. wide; capsule 1.3–1.6 mm. long ..... 104. *P. asperuloides.*
a. Leaves alternate throughout or nearly so, *j.*
  j. Leaves squamiform ..... 109. *P. squamifolia.*
  j. Leaves normal, linear or linear-oblong, or the lowest spatulate, *k.*
    k. Flowers 2.5–3.5 mm. long, *l.*
      l. Capsule ovate-oblong (West Indies) ..... 107. *P. hecatantha.*
      l. Capsule elliptic-oblong (Mexico) .... 106 *a*. *P. alba* var. *tenuifolia.*
    k. Flowers 1–1.3 mm. long ..... 101. *P. sphaerocephala.*

97. P. SAGINOIDES Griseb. Stems several to many, loosely spreading from a woody but slender root, angled, glabrous, slender, branched or subsimple, 2–10.5 cm. long. Leaves linear to linear-lanceolate, or the lower oval, the lower or sometimes nearly all in whorls of 5, acute to acuminate at each end, cuspidate, very shortly petioled, glabrous, punctate, 2–4 mm. long, 0.4–0.8 mm. wide. Racemes dense, up to 30-flowered, 2–(at length)16 mm. long, terminating stems and branches; bractlets ovate, acuminate, thickish, persistent, 0.5 mm. long. Flowers 1.5–2.5 mm. long. Upper sepal oval, obtuse, white-glandular-lineate, 1.3 mm. long; the lower ovate, 1.1 mm. long. Wings obovate, cuneate at base, strongly retuse at apex, whitish with green or reddish midrib and white longitudinal glandular lines, 2.5 mm. long, 1.3 mm. wide. Keel 2 mm. long; crest of 3 pairs of deeply divided lobes. Upper petals oval, rounded at apex, 1.6 mm. long. Capsule elliptic-ovate, truncate at apex, green with white and rosy glandular lines, 2 mm. long,

1.4 mm. wide. Seed obovoid-ellipsoid, 1.8 mm. long, appressed-pilose. Aril 1.3 mm. long, with small umbo and linear lateral lobes. — Griseb.! Cat. Pl. Cub. 13 (1866); Chod. Monog. ii. 150. t. 20. f. 34–35 (1893). — CUBA: Cachillas de Baracoa, 14 May, and San Marcos, 22 August, *Wright* 1911 (TYPE COLL.: BGK); grassy places, barren savannas, S. E. of Holguin, Oriente, 26–29 Nov. 1909, *Shafer* 2943 (G). — T. 2. FIG. 55. — Chodat's fig. 35 (t. 20) does not well represent the seed of this species.

98. P. SPATHULATA Griseb. Stems many, herbaceous from a woody base, slender, spreading, angulate, minutely roughened on the angles, otherwise glabrous, simple or branched, 4–28 cm. long. Leaves all in whorls of 4, shorter than the internodes, spatulate-obovate, mucronate at the rounded apex, cuneate at base, slightly glandular-denticulate on the barely revolute margin, punctate, 1-nerved, green and glabrous both sides, 3.5–9 mm. long, 2–6 mm. wide, the petioles very short. Racemes terminating stems and branches, 4–10-flowered, subsessile or very shortly peduncled; bracts persistent, spreading, ovate-attenuate, 0.5 mm. long; pedicels about 0.2 mm. long. Flowers 2.8 mm. long. Upper sepal oval, obtuse, 1.2 mm. long, the lower ovate, obtusish, 1 mm. long, each bearing 2–3 pairs of pedicelled glands on margin, glandular-lineate on back. Wings obovate-oblong, whitish, green-veined, acutish, short-clawed, 2.8 mm. long, 1.3 mm. wide, bearing a few microscopic cilia on margin, obscurely glandular-lineate on back. Keel 2.5 mm. long; crest of 3 pairs of simple or 2–3-fid oblong lobes. Upper petals oval, undulate at apex, 2 mm. long. Capsule elliptic, 2 mm. long, 1.3 mm. wide. Seed 2.1 mm. long, appressed subsilky-pilose. Aril 1.3 mm. long; umbo very minute; lateral lobes oblong, rounded at tip, appressed, scarious. — Griseb.! Cat. Pl. Cub. 13 (1866); Chod. Monog. ii. 134. t. 20. f. 8–10 (1893). — CUBA: banks among tall grass in savannas, San Juan de Buenavista, *Wright* 1910 (TYPE COLL.: BGK); open places, Baracoa, Oriente, Feb.–Mar. 1910, *Shafer* 3989 (G). BAHAMAS: *Northrop* 402 (K); *Britton & Millspaugh* 3130 (K); Great Bahama: Eight Mile Rocks, Feb. 1905, *Britton & Millspaugh* 2369 (G). — T. 2. FIG. 56.

99. P. CRUCIANELLOIDES DC. Stem slender, erect, branched above, angled, slightly puberulous, 1.5–2.5 dm. high, the branches often opposite. Leaves mostly in whorls of 5, rhomboidal, angled, revolute, glabrous, eglandulose, scarcely mucronate, 6–7 mm. long,

4 mm. wide. Racemes terminal, short. Flowers rosy, 3 mm. long. Sepals unequal, the upper elliptic, acute, the lower shorter, lanceolate, acute, green on back, membranaceous on margin, 1/3 as long as wings. Wings elliptic, subobtuse, slightly inequilateral, very shortly unguiculate. Upper petals rhomboidal, subemarginate, strongly inequilateral, equalling or surpassing the keel. Crest multifid, the segments linear, simple or bifid. Fruit unknown. — DC. Prod. i. 329 (1824), fide Chod. Monog. ii. 134. t. 20. f. 11–12 (1893). — Not seen; description condensed from Chodat, l. c. Based by De Candolle on specimens collected in Santo Domingo by *Nectoux*; redescribed by Chodat from specimens collected at the same place by the same collector.

100. P. CONFERTA A. W. Bennett. Slender annual, the stems solitary or rarely few, erect, glabrous, strongly angled, 7–14 cm. high, bearing 2–6 capitate racemes. Lower leaves (1–2 whorls) in 5's, spatulate-obovate, mucronate, 3.5–7.5 mm. long, 1.7–3.7 mm. wide; middle leaves (1–2 whorls) linear, acuminate, mucronate, subsessile, 7–13 mm. long, 0.6–1.2 mm. wide; branch leaves linear, scattered or sometimes whorled. Racemes capitate, densely flowered, 4–9 mm. long, 5.5–6 mm. thick, on mostly naked peduncles 2–4.5 cm. long; the bracts minute, quickly deciduous; pedicels 1.2–1.5 mm. long. Flowers roseate or greenish-white, 1.8 mm. long. Upper sepal orbicular-ovate, blunt, slightly denticulate toward apex, 1 mm. long; lower ovate, subacute, 0.8 mm. long. Wings oval, short-clawed, 1.8 mm. long, 1.1 mm. wide. Keel 1.5 mm. long; crest of about 2 pairs of papillate-margined lobes, the anterior oblong, simple or bifid, the posterior cuneate, 3-fid at apex. Capsule orbicular-oval, slightly oblique at each end, 1.3 mm. long, 1 mm. wide. Seed shortly pubescent, 1 mm. long. Aril 0.7 mm. deep, its lobes oblong, appressed. — A. W. Bennett in Hemsl. Diag. Pl. Nov. i. 2 (1878); Journ. Bot. xvii. 172 (1879); Wats. Proc. Am. Acad. xxii. 398 (1887); Chod. Monog. ii. 141. t. 20. f. 22 (1893). — JALISCO: plains near Guadalajara, 5 Oct. 1889, *Pringle* 2941 (G); Rio Blanco, Sept. 1886, *Palmer* 571 (BGK); gravelly plains of Guadalajara, 1525 m., 8 Oct. 1903, *Pringle* 11377 (GK); hillsides near Guadalajara, 1525 m., 15 Oct. 1903, *Pringle* 8759 (G). VERA CRUZ: near Orizaba, Aug. 1866, *Bourgeau* 3249 (GK); Orizaba, *Botteri* 822 (K); *Schmitz* (B). MICHOACAN: dry grassy slopes, hills of Patzcuaro, 12 Oct. 1892, *Pringle* 4267 (BGK).

GUATEMALA: Barranca de Fuerengo, Oct. 1865, *Bernoulli* 105 (K). — T. 2. FIG. 59. — The flowers are described by Bennett and Chodat (from *F. Mueller* 302, Orizaba, the type, in herb. Mart.) as subsessile, but the pedicels in all the specimens above cited are 1.2–1.5 mm. long and thus the longest of any species in the series. Nevertheless their agreement in all other points with the descriptions and Chodat's figures is so close that I have little hesitation in following Watson in referring the specimens quoted to this species.

101. P. SPHAEROCEPHALA Chod. Annual, 5–6 cm. high, simple or corymbosely branched above. Cotyledons and basal leaves opposite, broadly spatulate, 3 mm. long, 2.5 mm. wide; leaves once or twice verticillate below, the others alternate, 5–6 mm. long, 0.6–1.5 mm. wide, those of the branches few and smaller. Racemes terminal, capitate, 4.5–5 mm. thick, on naked peduncles 7–10 mm. long; flowers 1–1.3 mm. long, on pedicels less than 1 mm. long. Upper sepal broadly ovate, the lower ovate-lanceolate, acuminate. Wings broadly lance-elliptic, obtuse or subacute, 3-nerved, exceeding the corolla. Keel with a few-lobed crest. Upper petals broadly rhomboidal, obtuse. Capsule elliptic. Seed ovoid, sparsely hairy. Aril less than half as long as seed, its lobes spatulate. — Chod. Bot. Jahrb. lii. Beibl. 115. 80 (1914), as *P. sphaerocephalum*. — Not seen; described by Chodat from *Seler* 1222, from Patzcuaro, Michoacan.

102. P. TURGIDA Rose. Fleshy perennial, many-stemmed, the stems procumbent, whitish-green, angulate, glabrous, 1–3 dm. long. Leaves verticellate throughout in 5's, or a few uppermost scattered, spatulate-obovate, mucronate at the rounded apex, cuneate to base, thick, fleshy, barely petioled, glabrous, 7–24 mm. long, 3.5–10 mm. wide. Racemes 1.5–(at last)9 cm. long, 5 mm. thick, straight or curved, densely flowered, on peduncles 1.7–4.7 cm. long; pedicels 0.5 mm. long or less. Flowers pinkish, 2.5–2.8 mm. long. Upper sepal orbicular-ovate, obtusish, 1.5 mm. long, the lower deltoid-ovate, obtuse, 1.3 mm. long, each marked with 4 oblong whitish glands. Wings obovate, short-clawed, rounded at apex, 5-nerved, 2.8 mm. long, 1.5 mm. wide. Keel 2 mm. long; crest of 3 pairs of lobes, the posterior flabellate-cuneate, the anterior 2 oblong, entire or barely bifid. Upper petals elliptic, rounded or subtruncate at apex, barely erose on margin, 1.9 mm. long. Capsule orbicular-ovate, 1.4 mm. long, 1.2 mm. wide. Seed short-

pilose, 1.3 mm. long. Aril 1.2 mm. deep, its lobes linear-oblong-obovate, appressed. — Rose! Contr. U. S. Nat. Herb. x. 123. t. 39 (1906). *P. alba* Nutt. var. *alcalina* Chod.! Bull. Herb. Boiss. iii. 122 (1895). — San Luis Potosi: alkaline meadows, Hacienda de Angostura, 14 July 1891, *Pringle* 3792 (type coll. of both names: BG); Media Luna, near Rio Verde, 2–8 June 1904, *Palmer* 84 (G); 1830–2440 m., 1878, *Parry & Palmer* 39½ p. p. (K); *Purpus* 5173 (B). — T. 2. Fig. 54.

103. P. aparinoides Hook & Arn. Stems solitary or several from a slender perennial base, erect or laxly spreading, narrowly 5-angulate-winged, and minutely sparsely appressed-puberulent, 23 cm. long or more. Leaves verticillate in 5's throughout, or the uppemost rameal scattered, lanceolate to elliptic-lanceolate, or the lowest orbicular or elliptic-obovate, acute or subacute at each end, cuspidate, glandular-punctate, glabrous, 1-nerved, with narrow denticulate margin, 10–21 mm. long, 4.5–8 (10) mm. wide, on petioles 1 mm. long. Racemes rather densely many-flowered, becoming 16.5 cm. long or less, 5–6 mm. thick, on peduncles 8.5 cm. long or less; pedicels 0.5–0.7 mm. long. Flowers rosy, 3 mm. long. Upper sepal broadly oval, gland-dotted, sparsely glandular-ciliate, 1.8 mm. long; lower ovate, acutish, gland-dotted, sparsely glandular-ciliate, 1.5 mm. long. Wings spreading, elliptic-obovate, somewhat plicate, short-clawed, rounded at apex, with 5 pink nerves, gland-dotted, glabrous, 3 mm. long, 2 mm. wide. Keel 2.6 mm. long; crest of about 4 pairs of lobes, the posterior cuneate, scarcely lobed, the 3 anterior narrow, entire, oblong. Upper petals obliquely rhombic-ovate, 3.5 mm. long. Capsule broadly elliptic, 2–2.5 mm. long, 1.6–2.1 mm. wide. Seed shortly appressed-pilose, 2–2.1 mm. long, equalled by the narrowly oblong appressed lobes of the aril. — Hook. & Arn.! Bot. Beech. Voy. 277 (1836–40). *P. leptandroides* Turcz.! Bull. Soc. Nat. Mosc. xxvii. no. 2. 349 (1854). *P. nemoralis* A. W. Bennett! Journ. Bot. xvii. 172 (1879), in part. *P. Vogtii* Chod.! Monog. ii. 144. t. 20. f. 25–26 (1893). *P. verticillata* L. var. *aparinoides* (Hook. & Arn.) Chod. l. c. 140, as to syn. only. — Jalisco: *Beechey* (type: K). Chiapas: Feb., *Linden* 173 (K: type coll. of *P. leptandroides*, cotype coll. of *P. nemoralis*, cotype coll. of *P. Vogtii*). Guatemala: Chilasco, 1861, *Salvin & Godman* (cotype coll. of *P. nemoralis*: K); Laguna de Ayarces, July 1870, *Bernoulli* 662 (K); between Santa Rosa and El Patal,

Aug. 1870, *Bernoulli* 1019 (K); Sierra del Mico, Aug. 1870, *Bernoulli & Cario* 3233 (K); Coban, 1310 m., May 1886, *Tuerckheim* 136 (COTYPE COLL. of *P. Vogtii*: BGK); Coban, 1300 m., Jan. 1903, *Tuerckheim* 8378 (GK); San Miguel Uspantán, Dept. Quiché, 1830 m., Apr. 1892, *Heyde & Lux* 3004 (GK); Zamorora, Dept. Santa Rosa, 1800 m., Apr. 1893, *Heyde & Lux* 4438 (BGK). — T. 2. FIG. 64.

104. P. ASPERULOIDES HBK. Stems 1–2 from a slender probably annual root, slender, narrowly 5-angulate-winged, erectish or loosely spreading, branched or subsimple, 8–30 cm. long. Leaves all whorled in 5's (the uppermost sometimes in 3's or 2's), glandular-punctate, with narrow crenulate-denticulate margin, the lower orbicular-obovate, 7–9 mm. long, 4.5–5 mm. wide, the middle and upper lanceolate or lance-elliptic, acute or subacuminate at each end, 9–19 mm. long, 2.7–7 mm. wide, all cuspidate, on petioles ca. 1 mm. long. Racemes 1–(at length)5 cm. long, 3–5 mm. thick, on peduncles 1–3.2 cm. long; pedicels 0.4 mm. long. Flowers faintly pinkish, 2 mm. long. Upper sepal orbicular-ovate, obtuse, 1 mm. long, the lower oblong, obtuse, 0.6 mm. long, not ciliate, each with 2 large glands on back. Wings broadly elliptic, rounded at apex, short-clawed, 1.6 mm. long, 1 mm. wide. Keel 2 mm. long; crest of 3 pairs of lobes, the posterior cuneate, entire, adnate to keel, the 2 anterior linear or obovate, entire. Upper petals obliquely rhombic-ovate, 1.8 mm. long. Capsule suborbicular, 1.3–1.6 mm. long, 1.2–1.5 mm. wide. Seed shortly appressed-pilose, 1.5 mm. long. Aril 1.1 mm. deep, the 2 lobes oblong, appressed. — HBK! Nov. Gen. v. 403 (1821); Wats. Proc. Acad. xxi. 459 (1886). *P. galioides* Poir. var. *major* A. W. Benn. in Mart. Fl. Bras. xiii. pt. 3. 29 (1874), as to syn. only. *P. galioides* Poir. var. *asperuloides* (HBK.) Britton in Morong & Britton, Ann. N. Y. Acad. Sci. vii. 52 (1892), as to syn. — GUATEMALA: Carmino Real, near Izabal, 7 Apr. 1885, *S. Watson* 19 (G). BRITISH HONDURAS: wet pine ridge near Manatee Lagoon, 6 Dec. 1905, *M. E. Peck* 234 (G). Without locality: *Humboldt & Bonpland* (fragm. of TYPE: G). — T. 2. FIG. 63.

105. P. SUBALATA Wats. Stems several from a biennial or perennial slender root, erect or rarely spreading, simple or branched, leafy, glabrous, 6–17 cm. high. Leaves whorled about to middle of stem, punctate, glabrous, cuspidate, the lower (about 4 whorls) in 5's obovate, rounded at apex, cuneate at base, narrowly denticu-

late-margined, very shortly petioled, 3.5–6 mm. long, 1.5–3 mm. wide; middle and upper mostly scattered, lanceolate or lance-obovate or -elliptic, acute or acutish at each end, 7.5–14.5 mm. long, 2.3–4 mm. wide. Racemes dense, many-flowered, 1–(at length)4 cm. long, 5–6 mm. wide, on peduncles 0.3–3.4 cm. long. Flowers white with green nerves, 2.5 mm. long. Sepals lance-ovate, obtuse, white-margined, gland-dotted, 1 mm. long. Wings oval, rounded at apex, short-clawed, white with greenish center, 3–sub-5-nerved, gland-dotted, 2.5 mm. long, 1.3 mm. wide. Keel 2.3 mm. long; crest of 3 pairs of lobes: posterior pair cuneate, barely 3-fid at apex; 2 anterior pairs linear, entire. Upper petals oval, rounded at apex, 2.1 mm. long. Capsule suborbicular-elliptic, slightly oblique, 2 mm. long, 1.6 mm. wide. Seed 1.6 mm. long, sparsely appressed-pubescent, equalled by the linear-oblong appressed lobes of the aril. — Wats.! Proc. Am. Acad. xxvi. 132 (1891). — Durango: City of Durango, 1896, *Palmer* 908 (G). San Luis Potosi: San Miguelita Mts., Aug. 1877, *Schaffner* 5 (GK); Alvarez, July 1904, *Palmer* 205 (GK); 1830–2440 m., 1878, *Parry & Palmer* 39 p. p. (GK), 39½ p. p. (K). Vera Cruz: Vera Cruz to Orizaba, *F. Mueller* 999 (K); Maltrata, Jan. 1883, *Kerber* 243 (BK: nom. vernac. "mexixe"). Mexico: low ground, Flor de Maria, 4 Sept. 1890, *Pringle* 3240 (type coll.: BGK); Valley of Mexico, 1856, *Schmitz* (B). Federal District: base of Sierra de Ajusco, 2380 m., 29 Sept. 1896, *Pringle* 6550 (BGK); open woods near Eslaba, 2440 m., 18 Sept. 1903, *Pringle* 11382 (GK). Michoacan: Cerro de Quinzeo, 2590 m., *Galeotti* 876 (K). Oaxaca: 1842, *Ghiesbreght* (K). Mexico without locality: *Pavon* (B). — T. 2. Fig. 60.

106. P. alba Nutt. Stems numerous from a perennial root, often with a cluster of short sterile leafy branches at base, erect or ascending, simple or sparsely branched, glabrous, very narrowly angulate-winged, 2–3.5 dm. high. Leaves mostly scattered, but the lowest (2–7 whorls) or even those to middle of stem verticillate; lowest spatulate-obovate, mucronate at the rounded apex, scarcely petioled, with subdenticulate margin, 1-nerved, 4–12 mm. long, 1.5–2.5 mm. wide; the others linear, acuminate to the cuspidate apex, 0.8–2.5 cm. long, 1–1.5 mm. wide. Racemes densely flowered, conic-cylindric, 2–8.5 cm. long, 5–8 mm. thick, on peduncles 2–8 cm. long; pedicels 1 mm. long. Flowers white with green center,

the crest often purple, 2.5–3 mm. long. Upper sepal broadly ovate, obtuse, 1.5 mm. long, the lower oblong, 1.3 mm. long. Wings obliquely elliptic, rounded at apex, shortly cuneate at base, 2.9 mm. long, 1.6 mm. wide. Keel 3 mm. long; crest of 4 pairs of lobes, the posterior cuneate, the 3 anterior linear, entire. Upper petals ovate, obtuse, 2.8 mm. long. Capsule elliptic or oblong-elliptic, 2.5–2.9 mm. long, 1.3–1.6 mm. wide. Seed appressed-pilose, 2.3–2.5 mm. long. Aril (0.8) 1.3–1.5 mm. deep, its oblong obtuse lobes appressed. — Divisible into two varieties.

Var. **tenuifolia** (Pursh), comb. nov. Folia omnia alterna (verticillis 1–2 basalibus exceptis). — *P. Seneca* var. γ. *tenuifolia* Pursh, Fl. Am. Sept. ii. 750 (1814). *P. alba* Nutt.! Gen. ii. 87 (1818); Wats. Proc. Am. Acad. xxi. 416 (1886); Chod. Monog. ii. 135. t. 20. f. 13–14 (1893). *P. bicolor* HBK.! Nov. Gen. v. 394. t. 507 (1821). *P. alba* Nutt. var. *bicolor* (HBK.) Chod. l. c. 136 (1893). *P. Torreyi* G. Don, Gen. Sys. i. 360 (1831); Greene, Pitt. iii. 307 (1898). *P. Beyrichii* T. & G.! Fl. N. Am. i. 130 (1838). *P. scoparia* Benth.! Pl. Hartw. 8 (1839), not HBK. *P. alba* Nutt. var. *brachystachya* Chod.! l. c. 136 (1893); var. *leptostachya!* and var. *mexicana* Chod. l. c. 137. — Sonora: Fronteras, 1390 m., 24 Sept. 1890, *Hartman* 40 (G); Sept. 1851, *Thurber* 1092 (G). Chihuahua: Santa Eulalia Mts., 27 Oct. 1885, *Pringle* 299 (type coll. of var. *brachystachya*: BG); San Antonio de las Alanzanes, 1848–49, *Gregg* 371 (GK). Coahuila: Sierra Madre, 64 km. south of Saltillo, July 1880, *Palmer* 68 (G). Durango: near City of Durango, 1896, *Palmer* 129 (BG); Tejamen, Aug. 1906, *Palmer* 537 (G); Tepehuanes, Mar.–Apr. 1906, *Palmer* 43 (G). Zacatecas: *Coulter* 725 (GK); Guadalcajar, 1883, *Dugès* (G). Aguas Calientes: near Picocho, *Hartweg* 30 (BGK). Guanajuato: Santa Rosa, *Humboldt & Bonpland* (fragm. of type of *P. bicolor*: G). San Luis Potosi: 1878, *Parry & Palmer* 39 p. p. (K). Puebla: San Luis Tultitlanapa, June 1908, *Purpus* 3502 (G); Bagre, Minas de San Rafael, May 1911, *Purpus* 5165 p. p. (G). Sierra Madre, Mexico: *Seemann* (G: toward var. *suspecta*). Mexico without locality: *Beechey* (K). — T. 2. Fig. 61.

Var. suspecta Wats. Folia usque ad mediam partem caulis verticillata. — *P. alba* Nutt. var. (?) *suspecta* Wats.! Proc. Am. Acad. xxi. 416 (1886). *P. alba* var. *Schaffneri* Chod. Monog. ii. 137 (1893). — Chihuahua: 240 km. north of Batopilas, 1375 m., Nov. 1885,

Palmer 369 (COTYPE COLL.: G). COAHUILA: Sierra de la Paila, Oct. 1910, *Purpus* 4760 (BG). SAN LUIS POTOSI: San Miguelita Mts., Sept. 1877, *Schaffner* 4 (COTYPE COLL.: G); Bagre, Minas de San Rafael, May 1911, *Purpus* 5165 p. p. (G); 1830–2440 m., 1878, *Parry & Palmer* 39 p. p. (COTYPE COLL.: B); *Schaffner* 493 (B); *Purpus* 5165a (B). PUEBLA: calcareous soil, Tehuacan, 1675 m., 7 Aug. 1901, *Pringle* 8575 (BGK: approaching var. *tenuifolia*). OAXACA: Las Sedas, 1830 m., 15 Sept. 1894, *Pringle* 5717 (G: near var. *tènuifolia*). Sierra Madre, Mexico: *Seemann* 2153 (B). Also in southern ARIZONA: *Lemmon* 500 (G); *Blumer* 3336 (G); *T. E. Wilcox* (G).

107. P. HECATANTHA Urb. Stems numerous, erect, slightly branched above, from a woody slightly branched root, 5-angled and slightly winged, glabrous, about 6 dm. high, very leafy. Leaves linear or linear-lanceolate, alternate (except for 3–6 whorls below), 1-nerved, slightly rough on midnerve and margin, glabrous, slightly revolute, green both sides, subsessile, the middle ones 1.3–2 cm. long, 1.5 mm. wide, acuminate at each end, very acutely mucronate. Racemes becoming 8.5–14 cm. long, 6–7 mm. thick, densely flowered, on peduncles 3.5–9 mm. long. Flowers white, slightly pink-tinged, 3.5 mm. long. Sepals subherbaceous, whitish-margined, oblong-oval, obtuse, glabrous, 1.3–1.5 mm. long. Wings oval-ovate, retuse at apex, cuneate at base, glabrous, 3.5 mm. long, 1.7 mm. wide. Upper petals ovate, obtuse at apex, 3.2 mm. long. Keel 3.5 mm. long; crest of about 9 linear obtuse processes. Capsule ovate-oblong, obtuse, broadest near the base, 2.7–3.1 mm. long, 1.6 mm. wide. Seed pilose, 2.5 mm. long. Aril scarious, glabrous, 2-lobed, 1.3 mm. long. — Urb.! Sym. Antill. i. 331 (1899). — PORTO RICO: near Salinas da Cabo-Rojo, near Los Morrillos, 14 Feb. 1885, *Sintenis* 531 (COTYPE COLL.: BGK); near Lares, Feb. 1886, *Sintenis* (G). VIRGIN ISLANDS: sand dune, West End, Anagada, 19–20 Feb. 1913, *Britton & Fishlock* 948 (GK). — T. 2. FIG. 62.

108. P. **Wightiana,** sp. nov. Annua erecta vel adscendens unicaulis ramosa glabra 1.3–2.1 dm. alta, caule angulato vix alato. Folia ad mediam plantae partem et supra verticillata, ima (2–3 verticilli) obovata obtusa 3.5–7.5 mm. longa 1.7–2.5 mm. lata; media et superiora anguste lanceolata vel anguste lanceolato-obovata acuta mucronata basi anguste cuneata punctata 1-nervia subsessilia 8–17 mm. longa 1.5–2.6 mm. lata; suprema pauca alterna.

Racemi demum 2.2–8.5 cm. longi 4–4.8 mm. crassi densiflori, bracteis minutis lanceolato-subulatis subpersistentibus 0.6–0.8 mm. longis, in pedunculis 0.9–4.5 cm. longis. Flores albi et virides 2 mm. longi, in pedicellis 0.5 mm. longis. Sepalum superius suborbiculari-ovatum subacutum supra sparse ciliolatum in dorso glandulis ca. 4 oblongis lutescentibus donatum 1.2 mm. longum; inferiora similia 0.7 mm. longa. Alae late obliqueque ellipticae apice late rotundatae basi breviter cuneatae 5-nerviae in dorsso glanduli lineari-oblongis ca. 2 lutescentibus praeditae 2 mm. longae 1.4 mm. latae. Carina 2 mm. longa antice glandula lutescente praedita; crista e lobis 3-jugis postico cuneato adnato anticis 2 lineari-oblongis integris liberis constans. Capsula oblongo-elliptica basi obliqua emarginata 2 mm. longa 1.5 mm. lata. Semen pilosulum 1.6 mm. longum. Arillus 1 mm. altus, umbone minimo, lobis 2 lateralibus appressis lineari-oblongis. — BAHAMAS: border of marsh in loamy marl and honeycomb limestone, Adelaide Settlement, about 21 km. S. W. of Nassau, New Providence, 13 Apr. 1905, *A. E. Wight* 79 (TYPE: G); Red Bays, Andros I., 16 Apr. 1890, *J. I. & A. R. Northrop* 473 (GK). — T. 2. FIG. 58.

109. P. SQUAMIFOLIA C. Wr. Stems several, from a slender perennial root, sparsely branched above, slightly angled by the decurrent leaf-bases, slender, nearly naked, glabrous, 3.5–4.5 dm. long. Leaves alternate, or the lowest (obovate, very minute, about 1.5 mm. long) sometimes forming 5–6 whorls; a few of the lower sometimes lanceolate, acuminate, sessile, 5 mm. long, 1 mm. wide, the others scale-like, green, linear-subulate, acuminate, mucronate, concave above, rounded beneath, sessile, 3 mm. or less long. Racemes very dense, cylindric-conic, 0.5–(at length)5.5 cm. long, 4.5–5.5 mm. thick, on peduncles 1–2 cm. long; pedicels 0.2 mm. long; axis narrowly angulate-winged. Flowers whitish and greenish, 2.7 mm. long. Upper sepal orbicular-ovate, 1.3 mm. long, the lower ovate, 1 mm. long, all obtuse. Wings elliptic, rounded at apex, submucronulate, very shortly cuneate at base, 2.7 mm. long, 1.8 mm. wide. Keel 2 mm. long; crest of about 3 pairs of linear entire or bifid lobes. Upper petals broadly elliptic, shorter than the keel. All parts of flower gland-dotted or -lined. Style almost none. Capsule orbicular in outline, 1.3 mm. long and wide. Seed appressed-pilosulous, 1.3 mm. long. Aril 0.8 mm. long. — C. Wr.! in Griseb. Cat. Pl. Cub. 12 (1866); Chod. Monog. ii. 151. t. 20 (21). f.

36–37 (1893). — CUBA: 1860–64, *Wright* 1909 (TYPE COLL.: BGK); dry sandy places, near Laguna Jovero, Pinar del Rio, 5–7 Dec. 1911, *Shafer* 10714 (G). — T. 2. FIG. 57. — Approaching in raceme characters the next section but with wings not very much larger than keel.

Ser. *β*. TIMOUTOIDEAE Chod. Leaves alternate or verticillate; racemes very dense; wings much larger than keel; seed short-pubescent. — *Polygala* sect. *Orthopolygala* subsect. I. B. *Timoutoideae* Chod. Monog. ii. 153 (1893).

a. Sepals linear-subulate from an ovate base, longer than the wings ..... 110. *P. crinita.*
a. Sepals oval to lanceolate, much shorter than wings, *b*.
  b. Leaves linear-lanceolate, mostly alternate ..... 111. *P. hygrophila.*
  b. Leaves oval or obovate, mostly whorled in threes .... 112. *P. timoutou.*

110. P. CRINITA Chod. Erect freely but simply branched annual, single-stemmed, glabrous, 1.8 dm. high, the stem narrowly wing-angled. Leaves verticillate in 3's to middle of stem, alternate above, cuneate-obovate, cuspidate at the rounded apex (or the upper subacute), glabrous, scarcely petioled, 1.4–1.8 cm. long, 3–6 mm. wide. Racemes terminating stem and branches, cylindric, very dense, acutish, very comose at apex, 0.8–(at length)2.4 cm. long, 4.5–5 mm. thick; bracts filiform, 3 mm. long, loose, persistent. Flowers whitish, 2–2.3 mm. long, on pedicels 0.6 mm. long. Sepals with short ovate base and long filiform-subulate tip, 2.5 mm. long. Wings broadly elliptic, mucronulate at the rounded or retuse apex, scarcely narrowed at base, glabrous, 5-nerved, 2–2.3 mm. long, 1.8–1.9 mm. wide. Keel 1.7–1.8 mm. long; crest of two pairs of lobes, the posterior cuneate, adnate to keel, the anterior linear, entire, free. Upper petals oblong-ovate, oblique, rounded at apex, ca. 2 mm. long. Capsule suborbicular, 1.6 mm. long, 1.4 mm. wide. Seed 1.1 mm. long, sparsely pubescent. Aril 0.5 mm. deep. — Chod. Monog. ii. 156. t. 21. f. 7–8 (1893). *P. setifera* Brandeg.! Zoe v. 205 (1905). — SINALOA: grassy slopes, Cerro Colorado, near Culiacan, 1 Nov. 1904, *Brandegee* (TYPE COLL. of *P. setifera:* G). — T. 2. FIG. 65. — From Chodat's full description and figures there can be no doubt of the identity of his *P. crinita* (types *Karwinski* 303, 304 (hb. Monac.)) with Brandegee's *P. setifera.*

111. P. HYGROPHILA HBK. Slender erect annual, simple or slightly branched, glabrous throughout, about 3 dm. high, the stem narrowly wing-angled. Lowest leaves subverticillate, linear-

lanceolate, 6–9 mm. long, 0.8–1.2 mm. wide, the others alternate, sessile, mucronate, 1-nerved, slightly revolute, 13–18 mm. long, 1.5–2 mm. wide. Raceme cylindric-ovoid, thick, slightly comose at apex, 1.7–2 cm. long, 8–8.5 mm. thick; peduncle 1.8–2 cm. long; bracts deciduous in fruit. Sepals oval, bluntly pointed, with strong midnerve, 1.8 mm. long. Wings elliptic, rounded, about 7-nerved, brownish-white when dried, 4.5 mm. long, 3 mm. wide. Upper petals oval, rounded, equalling the keel. Keel 2.5 mm. long; crest of about 3 pairs of lobes. Capsule subglobose, turgid. Seed ellipsoid, blackish, short-pubescent, 1.7 mm. long. Aril 1 mm. long, the 2 lobes narrowly and obliquely oblong, corneous above. — HBK. Nov. Gen. v. 395. t. 508 (1821); Seemann! Bot. Herald 80 (1852–53) (as *P. hygrophylla*); Chod. Monog. ii. 161. t. 21. f. 11–12 (1893). — Panama: near the city of Panama, in savannas, *Seemann* 284 (B).

112. P. timoutou Aubl. Slender erect annual, simple or branched, 8–18 cm. high, very glabrous. Stem strongly about 3-angulate-winged. Leaves nearly all in whorls of 3 (the upper opposite or alternate), oval or obovate, mucronate at the acutish apex, cuneate to the sessile base, 1-nerved, 4.5–9 mm. long, 3–4 mm. wide. Racemes very dense, greenish in dried specimens, very slightly comose at apex, 1–3.8 cm. long, 5–6.5 mm. thick, short-peduncled. Flowers ca. 3 mm. long. Sepals greenish, lanceolate, subacuminate, about one-half as long as wings. Wings greenish in dried specimens, " purplish " when fresh, broadly oval, rounded at apex, about 4-nerved, 2.8 mm. long, 1.8 mm. wide. Keel 2 mm. long; crest of 2 pairs of lobes. Upper petals about equalling keel, obovate-oblong, strongly retuse. Capsule orbicular-ovate, emarginulate, 1.2 mm. long, 1 mm. wide. Seed sparsely pubescent, black, oval, plump, 1.2 mm. long. Aril with oblong lobes about 0.8 mm. long. — Aubl. Pl. Guian. ii. 737. t. 295 (1775); Griseb.! Fl. Br. W. Ind. 27 (1859); Chod. Monog. ii. 154. t. 21. f. 1–3 (1893). — Trinidad: savanna de O'Mara, July 1848, *Purdie* 122 (K); savanna d'Aripo, Feb. 1851, *Crueger* (G); without locality, *Fendler* 269 (K, fragm. G). — T. 2. Fig. 66.

Ser. γ. Glochidiatae Chod. Plant very slender; stem leaves verticillate; racemes loose, the flowers very small; seed densely pubescent with glochidiate hairs. — *Polygala* sect. *Orthopolygala* subsect. I. C. *Glochidiatae* Chod. Monog. ii. 164 (1893).

113. P. GLOCHIDIATA HBK. Very slender annual, usually freely branched, 3.2 dm. high or less, the stem scarcely angled, finely pedicellate-glandular. Leaves verticillate in 5's to middle of stem or above it; the lowest lance-obovate, acute at each end, cuspidate, 3–4.5 mm. long, 1 mm. wide; middle and upper linear or linear-lanceolate, acuminate at each end, subsessile, cuspidate, slightly revolute, 5–12.5 mm. long, 0.5–1.5 mm. wide; those of branches alternate, smaller. Racemes rather loosely many-flowered, cylindric, 1.3–(at length)8 cm. long, 4.5–6 mm. thick, on peduncles 1–4 cm. long; pedicels 0.6–0.8 mm. long. Flowers rosy-purple or rarely white, 2–2.3 mm. long. Upper sepal elliptic, obtuse, pinkish (rarely whitish), 1.2 mm. long; lower sepals oblong, obtuse, pinkish (rarely whitish) 0.9 mm. long. Wings obovate-oval, short-cuneate at base, rounded at apex, 3-nerved, 2.3–2.5 mm. long, 1.3 mm. wide. Keel 2.1 mm. long; crest of 3–4 pairs of lobes, the posterior obliquely lanceolate, obtuse, the 2–3 outer linear-lanceolate to linear. Upper petals oblong-ovate, obtuse, 1.8 mm. long. Capsule elliptic, 1.5 mm. long, 1 mm. wide. Seed 1.1 mm. long, clothed with incurved uncinate-tipped hairs (spreading when wet). Aril obsolete. — HBK. Nov. Gen. v. 400 (1821); Chod. Monog. ii. 164. t. 21. f. 15–16 (1893). (?) *P. uncinata* C. Wr. ex Millsp. Field Col. Mus. Pub. Bot. i. 429 (1900). — Two color forms may be recognized.

Forma **typica.** Flores purpurei. — LOWER CALIFORNIA: Cañon Honda, 21 Oct. 1893, *Brandegee* (G). SONORA: Puerta de Los Pinitos, 1750 m., 14 Oct. 1890, *Hartman* 148 (BGK); Alamos, Sept. 1890, *Palmer* 743 (GK). SINALOA: Cerro de Pinal, Dec. 1848, *Seemann* 1519 p. p. (K). ZACATECAS: *Coulter* 727 (K). SAN LUIS POTOSI: sandy places near Morales, Aug. 1877, *Schaffner* 1 (G). JALISCO: Rio Blanco, Sept. 1886, *Palmer* 546 (BGK); plains of Guadalajara, 26 Nov. 1888, *Pringle* 1808 (BGK); gravelly plains of Guadalajara, 1525 m., 8 Oct. 1903, *Pringle* 11378 (GK). VERA CRUZ: Vera Cruz to Orizaba, *F. Mueller* 890 (K); Protrero de Consoquitla, Aug. 1841, *Liebmann* (K); Orizaba, *Botteri* 820 (BK), 1120 (G). Western Mexico: *Seemann* (K). GUATEMALA: grassy places, Llano de la Laguna de Ayarces, July 1870, *Bernoulli* 696 (K); crevices of rocks, Volcan Viejo, 1220 m., Feb. 1838, *Barclay* 2123 (B). CUBA: *Wright* 1905 (BGK), 1907 (GK). — T. 2. FIG. 67.

Forma **leucantha.** Alae albae costa viridi, sepalis viridibus albo-marginatis. — CHIAPAS: Sierra de Tonala, Sept. 1913, *Purpus* 6645 (TYPE COLL.: BG).

Wright 1907 is peculiar in its few whorls (about 5) of small leaves, and long simple or subsimple nearly naked stem (2.7–3.2 dm. tall), but shows no technical characters of any importance, and has the glandular stem characteristic of *P. glochidiata*. The type of *P. uncinata* C. Wr. has not been seen, but from description it seems scarcely different from *Wright* 1907.

Ser. δ. Trichospermae Chod. Slender annuals with alternate leaves or the lowest whorled or opposite; capsule elliptic to ovate-oblong, bearing concpicuous dorsal glands; seed conic, long-pilose, the hairs forming a coma at its base. — *Polygala* sect. *Orthopolygala* subsect. I. D. *Trichospermae* Chod. Monog. ii. 170 (1893).

a. Capsule much longer than wings, *b.*
  b. Stems densely pedicellate-glandular . . . . . 114. *P. Berlandieri.*
  b. Stems glabrous . . . . . 115. *P. brachyptera.*
a. Capsule shorter than wings, *c.*
  c. Wings strongly cuspidate . . . . . 116. *P. longicaulis.*
  c. Wings not or only slightly cuspidate, *d.*
    d. Keel scarcely equalling wings; wings obtuse . . . . . 118. *P. variabilis.*
    d. Keel ¼ longer than wings; wings slightly mucronate . . 117. *P. exserta.*

114. P. Berlandieri Wats. Slender annual, generally freely branched, 7–17 cm. tall, the stem and branches terete, densely pedicellate-glandular. Leaves verticillate or subverticillate in 4's or 5's toward base but mostly alternate, linear, acute to acuminate at each end, cuspidate, sparsely glandular along the midrib and slightly revolute margin or subglabrous, 5–19 mm. long, 0.5–1.5 mm. wide, on petioles 0.5 mm. long. Racemes rather loosely flowered, becoming 3–5 cm. long, on peduncles 1 cm. long or less; pedicels 0.8–0.9 mm. long. Flowers white or pinkish, 2.1–2.5 mm. long. Upper sepal orbicular-ovate, acutish, with two indistinct longitudinal glands on back, 1.2 mm. long; lower sepals ovate-oblong, obtuse, 1.1 mm. long, with two oblong glands on back. Wings spatulate-obovate, rounded at apex, 3-nerved, 2.3 mm. long, 1.1 mm. wide. Keel 2.3 mm. long, the crest of 2 pairs of lobes, the posterior oblong, rounded, adnate to keel, the anterior longer, linear. Upper petals obliquely ovate, truncate or emarginulate at apex, equalling keel. Capsule narrowly elliptic, 3.3 mm. long, 1.2 mm. wide. Seed (including coma) 2.5 mm. long, silky-appressed-pubescent. Aril 0.5 mm. long. — Wats.! Proc. Am. Acad. xxi. 416 (1886); Chod. Monog. ii. 174. t. 21. f. 29–30 (1893), excl. var. *bogotensis*. — Lower California: Sierra de San Francisquito, 18 Oct. 1890, *Brandegee* 20 (G); El Taste, 12 Sept. 1893, *Brandegee*

(G). CHIHUAHUA: Combre, summit above Batopilas, 2590 m., Aug.–Nov. 1885, *Palmer* 323 (COTYPE COLL.: G). TAMAULIPAS: Sacahuales, between Tula and Tampico, Nov. 1830, *Berlandier* 721 (COTYPE COLL.: G) and 2138 (COTYPE COLL.: BGK). JALISCO: Guadalajara, Sept. 1886, *Palmer* 470 (BGK); plains of Guadalajara, 27 Nov. 1888, *Pringle* 1809 (BGK); gravelly plains of Guadalajara, 1525 m., 12 Oct. 1903, *Pringle* 11376 (GK). VERA CRUZ: Orizaba, *Botteri* 823 (K) and 1119 (COTYPE COLL.: G). OAXACA: El Marquesado, 1600 m., Sept. 1901, *Conzatti & González* 1186 (G). GUATEMALA: Santa Rosa, 915 m., June 1892, *Heyde & Lux* 3008 (GK); *Heyde & Lux* 3005b (K). — T. 2. FIG. 68.

115. P. BRACHYPTERA Griseb. Annual, very slender, simple or sparsely branched above, 1.7–2.8 dm. long, the stem angled, glabrous. Leaves (except a single basal whorl) scattered, linear, slightly revolute, glabrous, cuspidate, subsessile, 3–6 mm. long, 0.3–0.5 mm. wide. Racemes 1–3, conic, 3–11 mm. long, 4–6 mm. thick, densely flowered, on peduncles 1.3–2.1 cm. long; pedicels 0.7 mm. long. Flowers white, green-veined, 2.4 mm. long. Upper sepal oval, mucronate, acute, bearing two oval glands toward base, 1.5 mm. long; lower oval-oblong, acute, similarly glanduliferous, 1 mm. long. Wings narrowly elliptic, abruptly pointed, not clawed, bearing 2–3 basal glands, 3-nerved, 1.8 mm. long, 1 mm. wide. Keel 2.4 mm. long, equalled by the narrowly oblong rounded upper petals; crest of 3 pairs of lobes, the posterior cuneate, adnate to keel, the 2 anterior linear. Capsule thin-walled, ovate-elliptic, 3.5 mm. long, 1.7 mm. wide, bearing a series of oblong glands near the septum. Seed (including coma) 2.6 mm. long, appressed-silky-pilose, conic. Aril infra-apical, minute, 0.4 mm. long, its lobes linear. — Griseb.! Cat. Pl. Cub. 12 (1866); Chod. Monog. ii. 179. t. 21. f. 35–36 (1893). — CUBA: savanna, Habo del Medir, 27 Aug., *Wright* 1912 (TYPE COLL.: BGK). — Flowers yellowish-green according to Wright, but appearing whitish. — T. 2. FIG. 69.

116. P. LONGICAULIS HBK. Slender erect annual, sparsely branched (usually above the middle) or subsimple, 6 dm. high or less, the stems several-angled, glabrous or sparsely pedicellate-glandular below. Leaves all alternate (or a single whorl of 3 reduced narrow-obovate leaves at base), linear or linear-oblong or -lancolate, acuminate, cuspidate, 1-nerved, glabrous, subsessile,

slightly revolute, punctate, 5–12 mm. long, 1–3 mm. wide. Racemes depressed-subglobose, 6–12 mm. (axis becoming 3.5 cm.) long, 6–13 mm. thick, on peduncles 2–20 cm. long, usually naked; pedicels 2–2.5 mm. long. Flowers varying from (yellowish ?) white through pink to deep magenta-purple, 4.5–5 mm. long. Upper sepal elliptic-ovate, strongly cuspidate, 5-nerved, 2.3 mm. long; lower ovate, acuminate, strongly cuspidate, 1.8 mm. long; each sepal bearing 2–3 small glands dorsally toward base. Wings elliptic, obtuse at the very strongly cuspidate apex, cuneate-rounded not clawed at base, strongly 3-nerved, bearing a few small glands on back, 4.5–5 mm. long, 1.6–2.3 mm. wide. Keel 4.7 mm. long; crest of 3–4 pairs of lobes, the posterior lanceolate, the others linear or linear-lanceolate. Upper petals equalling keel, united to it for about 3 mm., the free portion obliquely lance-ovate, acutish. Capsule ovate-oblong, bearing a double line of oval glands along the septum, 3 mm. long, 1.3 mm. wide. Seed conic, silky-pilose, comose at base, 2.5 mm. long (including coma). Aril small, 2-lobed. — HBK. Nov. Gen. v. 396 (1821); Chod. Monog. ii. 182. t. 21. f. 41 (1893). *P. stellera* DC. Prod. i. 327 (1824), fide Chod. l. c. *P. longicaulis* subvar. *nana* Chod. l. c. 183 (1893). — Jalisco: Rio Blanco, Sept. 1886, *Palmer* 553 (BGK); dry porphyritic hills near Guadalajara, 5 Dec. 1888, *Pringle* 1830 (BGK); Sierra de San Esteban near Guadalajara, 1525 m., 13 Oct. 1903, *Pringle* 11380 (GK). Vera Cruz: dry mountains, Zacuapan, Aug. 1906, *Purpus* 2073 (G); Mirador, Sept. 1838, *Linden* 176 (K); alt. 915 m., *Galeotti* 7036 (K). Mexico without locality: *Pavon* (B). British Honduras: low pine ridge near Manatee Lagoon, 25 Aug. 1905, *M. E. Peck* 132 (G). Guatemala: Estanzuela, Dept. Santa Rosa, 760 m., Aug. 1892, *Heyde & Lux* 3942 (GK). Panama: *Seemann* 283 (B). Cuba: savannas, Vueltabago, 1860–64, *Wright* 1908 (BGK); poor soil near source of small stream, Cieneguita, Santa Clara, 8 Aug. 1895, *Combs* 442 (GK). Isle of Pines: June–July 1901, *A. A. Taylor* 158 (G); near Nueva Gerona, 26 May 1904, *Curtiss* 514 (BGK). Santo Domingo: 1852, *Schomburgk* 68 (K). Porto Rico: pastures of Mt. Mesa, Mayaguez, 24 Oct. 1884, *Sintenis* 41 (GK). Trinidad: savannas above St. Joseph, July 1848, *Crueger* (G); O'Meara, 9 Apr. 1848, *Crueger* (K); savanna de Omara, 7 July 1848, *Purdie* 29 (K); Arimo, 455 m., *J. R. Murray* 1338 (K). — T. 2. Fig. 70, 70*a*.

117. P. **exserta,** sp. nov. Annua tenuis erecta glaberrima simplex vel supra parce ramosa 11.5–21.5 cm. alta. Caulis teres vel supra subangulatus non alatus. Folia omnia alterna linearia mucronata crassiuscula sessilia 3–16 mm. longa 0.25–0.5 mm. lata. Racemi densiflori 1–(demum)4 cm. longi, bracteis et floribus inferioribus deciduis. Flores rosei 5.5–6.5 mm. longi. Sepala albida oblonga obtusa inferiora breviora. Alae roseae oblongae submucronatae 3-nerviae 5 mm. longae 1 mm. latae. Carina angusta ad 6.2 mm. longa, apice flavido-brunnea; crista e lobis 1-jugis ovato-lanceolatis obtusiusculis porrectis integris constans. Capsula anguste oblongo-ovata albida anguste marginata ad septum glanduloso-punctata 3.5 mm. longa ad 1.2 mm. lata. Semen conicum sericeo-comosum 1.1 mm. longum. Arillus ad 0.3 mm. longus, lobis 2 linearibus appressis. — TRINIDAD: Fort George, 12 Sept. 1847, *Crueger* (K); savanna de Arito, July 1848, *Wm. Purdie* 121 (K); without locality, 1877–80, *Fendler* 267 (GK: TYPE COLL.); without locality, *Crueger* (G). — The Crueger plant (hb. Kew.) was included in *P. longicaulis* by Grisebach. All the specimens in hb. Kew. are labelled *P. adenophora* DC. by Bennett, but that is a South American species with a several-lobed crest.—T. 2. FIG. 71.

118. P. VARIABILIS HBK. Erect slender annual, sparsely branched, 1.7–6 dm. high, the stem angled, obscurely pedicellate-glandular especially below. Leaves all alternate, linear, cuspidulate at the acute or acuminate apex, revolute, punctate, 1-nerved, glabrous, 3.5–9 mm. long, 0.4–0.7 mm. wide, on petioles 0.5 mm. long. Racemes somewhat dense, conic-capitate, 3–7 mm. long, 7 mm. thick, the axis becoming 1.5–7 cm. long; pedicels 0.6–0.8 mm. long. Flowers white or purplish, 2.7–3.6 mm. long. Upper sepals ovate, blunt, with 2–3 basal glands, 1.5–1.9 mm. long; the lower ovate, obtuse, with several dorsal glands along costa, 1–1.4 mm. long. Wings elliptic, rounded or rarely bluntly mucronulate at apex, cuneate scarcely clawed at base, 3-nerved, more or less gland-bearing along costa, 2.7–3.6 mm. long, 1.4–2.1 mm. wide. Keel 2.7–3.6 mm. long, gland-bearing; crest of 3–4 pairs of lobes, the posterior lanceolate, simple or bifid, the anterior linear, deeply forked or entire. Upper petals obliquely ovate-lanceolate, obtuse, equalling keel. Capsule ovate-oblong, obtuse, bearing about two rows of oval glands each side of septum, 2.6–3.2 mm. long, 1.2–1.3 mm. wide. Seed conic, silky-comose, 2.7 mm. long (including

coma). Aril 2-lobed, appressed, 0.5 mm. long. — HBK. Nov. Gen. v. 397. t. 509 (1821); Chod. Monog. ii. 180. t. 21. f. 37–38 (1893). *P. Nelsonii* Rose, Contr. U. S. Nat. Herb. x. 122. t. 38 (1906). — Divisible into two color forms.

Forma **typica**. Flores purpurei. — VERA CRUZ: dry meadows, Zacuapan, Aug. 1906, *Purpus* 2074 (G); Mirador, *Liebmann* 15 (K). Mexico without locality: *Haenke* G). BRITISH HONDURAS: open ground, near Manatee Lagoon, 27 Sept. 1905, *M. E. Peck* 147 (G). HONDURAS: Stann Creek, 13 April, *Rev. J. Robertson* 194 (B).

Forma **leucanthema**. Flores albi. — VERA CRUZ: Salina Cruz, 22 Dec. 1898, *C. C. Deam* 99 (TYPE: G). — T. 2. FIG. 72, 72*a*. — *Deam* 99 ,in addition to being white-flowered, differs in its considerably smaller flowers (the minima in the measurements above), but agrees in all technical characters with *Purpus* 2074. *P. variabilis* has been confused with *P. trichosperma* L., but differs in its longer aril-lobes, those of *P. trichosperma* being very minute.

Ser. ϵ. TENUES Chod. Slender annuals, the linear leaves alternate throughout or sometimes opposite or whorled below; racemes very slender, the flowers tiny; seed glabrous or sparsely short-pubescent with straight hairs, never comose. — *Polygala* sect. *Orthopolygala* subsect. I. H. *Tenues* Chod. Monog. ii. 214 (1893).

a. Seed glabrous; aril very minute, *b*.
  b. Racemes white, very dense; bracts persistent . . . . . 119. *P. gracillima*.
  b. Racemes looser, pink; bracts deciduous . . . . . 120. *P. decidua*.
a. Seed pubescent; aril evident, *c*.
  c. Plant glabrous, *d*.
    d. Aril tiny, barely 2-lobed, about $\frac{1}{10}$ as long as seed . . . 121. *P. paludosa*.
    d. Aril $\frac{1}{3}$ as long as seed . . . . . 122. *P. gracilis*.
  c. Plant finely stipitate-glandular; aril $\frac{1}{4}$—$\frac{1}{2}$ as long as seed 123. *P. paniculata*.

119. P. GRACILLIMA Wats. Annual, erect, branched above, 9–21 cm. high, the almost filiform stems glabrous, not angled. Leaves (except 1–2 whorls of 3 obovate leaves at extreme base, 3–3.5 mm. long, 1.5–2 mm. wide) scattered, ascending, linear, cuspidate, gland-dotted, glabrous, subsessile, 2–7 mm. long, 0.3–0.6 mm. wide. Racemes very slenderly conic-cylindric, dense, 6–22 (axis becoming 28) mm. long, 2–2.6 mm. thick, on peduncles 9–27 mm. long; pedicels 0.2 mm. long; bracts lance-subulate, bearing a large gland at base, 0.8 mm. long, spreading-ascending, persistent. Flowers white, 1.3 mm. long. Upper sepal oval, obtuse, lower ovate, acute, 0.6 mm. long. Wings oblong-oval, rounded at apex, short-clawed

at base, 3-nerved, 1.3 mm. long, 0.7 mm. wide. Keel 1–1.1 mm. long; crest of 2 pairs of lobes, the posterior adnate, cuneate, emarginate, the anterior linear. Upper petals oblong-oval, rounded at apex, 1.2 mm. long. Stamens 6. Capsule suborbicular, 1.1 mm. long, 1 mm. wide, bearing about 2 oval glands on each side of septum. Seed black, glabrous, ellipsoid-fusiform, striate, 0.5 mm. long. Aril extremely minute. — Wats.! Proc. Am. Acad. xxii. 398 (1887); Chod. Monog. ii. 216. t. 23. f. 22–24 (1893). — SINALOA: Cerro de Pinal, Dec. 1848, *Seemann* 1519 p. p. (K). JALISCO: Rio Blanco, Oct. 1886, *Palmer* 756 (TYPE COLL.: BGK); bare hills near Guadalajara, 5 Dec. 1888, *Pringle* 1829 (BGK); moist ravines of Rio Blanco near Guadalajara, 1525 m., 13 Oct. 1903, *Pringle* 11379 (GK). MORELOS: damp soil near Cuernavaca, 16 Nov. 1895, *Pringle* 7057 (G). GUATEMALA: damp shady places, between Cubuleo and Foyabaj, Sept. 1870, *Bernoulli* 1102 (K). — T. 2. FIG. 73.

120. P. **decidua,** sp. nov. Annua tenuis erecta sparse ramosa 2.2–3.1 dm. alta, caule glabro vix angulato, ramis erectis. Folia linearia alterna acuta mucronata basi paullulum angustata 1-nervia paullum revoluta glabra erecta 8–10 mm. longa 0.6–0.7 mm. lata, in petiolis ca. 0.5 mm. longis. Racemi tenues cylindrici apice acuti vix comosi sublaxiflori 1–4 cm. longi (axi demum 10 cm. longo) 4–6 mm. dimetente in pedunculis 0.6–3.5 cm. longis; bracteis citius deciduis; pedicellis 0.6–0.9 mm. longis. Flores rosei 1.9–2.3 mm. longi. Sepalum superius ovatum obtusum 1 mm. longum; inferiora lanceolato-ovata 0.8 mm. longa; omnia basi glandulis 2–3 donata. Alae spathulato-obovatae obtusae 3-nerviae 2–2.3 mm. longae 0.8 mm. latae. Carina 1.8–2 mm. longa; crista e lobis 2-jugis postico lanceolato obtuso integro ad carinam adnato et antico trilobato constans. Petala superiora oblonga apice emarginata ad 1.5 mm. longa. Capsula elliptica emarginata ad septum utrinque glandulis uniseriatis praedita 2 mm. longa 1 mm. lata. Semen cylindricum glabrum utroque obtusum longitudinaliter puncticulatum 1.2 mm. longum. Arillus minimus. — DURANGO: near City of Durango, Apr.–Nov. 1896, *Palmer* 615 (TYPE COLL.: BGK). — T. 2. FIG. 74, 74*a*.

121. P. PALUDOSA St. Hil. Slender annual, simple or usually branched, erect, up to 5.6 dm. high, the stem and erect branches subangulate, glabrous. Leaves all scattered, linear, acuminate,

glabrous, slightly revolute, 1-nerved, 8–25 mm. long, 0.4–0.8 mm. wide, on petioles ca. 0.5 mm. long. Racemes rather loosely or somewhat densely cylindric, 1–9 (axis at length 13) cm. long, 5–5.5 mm. thick; bracts quickly deciduous; pedicels 0.8–1 mm. long. Flowers rosy, 2 mm. long. Sepals 1 mm. long, obtuse, the upper broadly ovate, the lower ovate. Wings obovate, rounded at apex, cuneate at base, 3-nerved, 2 mm. long, 0.9 mm. wide. Keel 2 mm. long; crest of 2–3 pairs of lobes, the posterior 2-lobed, the inner division cuneate, the outer linear, the 1–2 anterior pairs linear-lanceolate, all obtuse. Upper petals obliquely oblong, emarginate at the somewhat narrowed apex, 1.7 mm. long. Capsule oblong, very slightly narrowed toward apex, with a row of glands each side of septum, 1.6–1.8 mm. long, 0.8–0.9 mm. wide. Seed subcylindric, subsparsely appressed-pubescent, 1.2 mm. long. Aril very minute, 2-lobed, appressed, about 1/10 as long as seed. — St. Hil. Fl. Bras. Merid. ii. 8 (1829), excl. vars. in part; Chod. Monog. ii. 226. t. 24. f. 4–5 (1893); Rob. in Gray, Syn. Fl. i. pt. i. 455 (1897). *P. leptocaulis* T. & G.! Fl. N. Am. i. 130 (1838); Wats. Proc. Am. Acad. xxii. 398 (1887). *P. Pringlei* Wats.! Proc. Am. Acad. xxv. 142 (1890). *P. paludosa* St. Hil. var. *exappendiculata* Chod. Monog. ii. 226 (1893). *P. gracilis* auct. plur., non HBK. — Jalisco: Guadalajara, Sept. 1886, *Palmer* 447 (BG); wet places near Guadalajara, 16 Nov. 1889, *Pringle* 2148 (cotype coll. of *P. Pringlei*: G); wet places, plains of Guadalajara, 2 Oct. 1889, *Pringle* 2452 (cotype coll. of *P. Pringlei*: BGK); high meadows, barranca of Portillo, 3 Oct. 1908, *Barnes & Land* 235 (G). Vera Cruz: Vera Cruz to Orizaba, *F. Mueller* 925 (K); Orizaba, *Botteri* 819 (K), 829 (B), 1118 (G). Morelos: wet meadows near Cuernavaca, 15 Nov. 1895, *Pringle* (G); moist meadows near Cuernavaca, 1525 m., 9 Sept. 1903, *Pringle* 11381 (GK). Mexico without locality: *Pavon* (B). Guatemala: El Jute, Dept. Quiché, 3355 m., Apr. 1892, *Heyde & Lux* 3006 (GK). Cuba: savannas, Vueltabajo, 22 July, Habo del Medio, 24 Aug., Hanabana, 13 March, *Wright* 1904 (BGK); Laguna de Castellano, Prov. Habana, 1905, *Baker & Alarca* 4330 (K). Isle of Pines: June–July 1901, *A. A. Taylor* 156 (G); near Nueva Gerona, 19 Feb. 1904, *Curtiss* 358 (BGK). Also in the southern U. S. and S. A. — T. 2. Fig. 75, 75a. — Frequently confused with *P. paniculata*, which is finely glandular, and with *P. gracilis*, which has an aril 1/3 as long as seed. Dr. Robinson

(Syn. Fl. l. c.) has already pointed out that Chodat's var. *exappendiculata* was based on a misapprehension of the characters of the northern form of the species.

122. P. GRACILIS HBK. Erect slender annual, sparsely branched above, 4 dm. high, the stem angled, glabrous. Leaves alternate, linear, acuminate to the cuspidate apex, scarcely narrowed at base, glabrous, thickish, 3–9 mm. long, 0.2–0.5 wide, subsessile. Racemes slightly loose, cylindric, 1–1.7 cm. long (axis becoming 3–9 cm. long); pedicels 0.7 mm. long. Flowers rosy, 2.6 mm. long. Upper sepal broadly ovate, obtuse, 1.4 mm. long; lower sepals narrowly oblong-lanceolate, acutish, 1.4 mm. long. Wings narrowly spatulate-obovate, truncate-rounded at apex, long-cuneate at base, 3-nerved, 2.6 mm. long, 1 mm. wide. Keel 2.4 mm. long; crest of about 3 pairs of lobes, the posterior lanceolate, obtuse, adnate to keel, the 2 anterior linear. Upper petals oblong-ovate, obtuse or slightly emarginate at the apex, equalling keel. Capsule oblong-oval, emarginate, 1.6 mm. long, 1 mm. wide. Seed 1.5 mm. long, subsparsely appressed-pubescent. Aril 0.6 mm. long, its lobes linear-oblong, appressed. — HBK. Nov. Gen. v. 401 (1821); Chod. Monog. ii. 228. t. 24. f. 8–9 (1893). — CHIAPAS: plains, temperate region, June (1864–70), *Ghiesbreght* 861 (G). Also in S. A., and reported by Chodat from the Antilles. — T. 2. FIG. 76.

123. P. PANICULATA L. Slender annual, sparsely or densely branched, erect, 0.6–4 dm. high, the stem and leaves densely pedicellate-glandular. Leaves alternate (except for a few whorls of 2–4 below), linear or linear-spatulate, rarely linear-obovate, mucronate at the acute apex, cuneate at the distinctly petioled base, 1-nerved, slightly revolute, more or less pedicellate-glandular, 8–18 mm. long, 1–2.5(4) mm. wide, on petioles 0.5 mm. long. Racemes loosely flowered, cylindric, 6 cm. long or less (the axis becoming 9.5 cm. long), 5–6 mm. thick; bracts early deciduous; pedicels 0.7–1 mm. long. Flowers rosy or purplish, rarely white, 2–2.5 mm. long. Upper sepal broadly ovate, obtuse, bearing 2 glands at base, 1.3 mm. long; the lower oblong-ovate, obtuse, bearing 2 glands at base, 1.2 mm. long. Wings obovate or spatulate-obovate, rounded at apex, long-cuneate at base, 3-nerved, 2–2.5 mm. long, 0.7–1 mm. wide. Keel 2–2.5 mm. long; crest of 3–4 pairs of lobes, the posterior broadly lanceolate, acutish, adnate to keel, the 2–3 anterior linear to linear-lanceolate, entire. Upper petals lanceolate-oblong, acut-

ish, exceeding keel. Capsule elliptic, 1.7 mm. long, 1.1–1.2 mm. wide. Seed 1.5 mm. long, shortly appressed-pubescent. Aril 0.4–0.8 mm. long, its 2 lobes scarious, appressed, narrowly oblong. — L. Am. Acad. v. 402 (1759); Chod. Monog. ii. 229. t. 24. f. 10–11 (1893). *P. paniculata* α. *normalis* Ktze. Rev. i. 49 (1891). *P. paniculata* L. forma *humilis* Chod. Bull. Soc. Bot. Belg. xxx. 301 (1891). *P. paniculata* L. var. *verticillata* Chod l. c. 302 (1891). — Divisible into two color forms.

Forma HUMILIS Chod. l. c. Flores rosei vel roseo-purpurei. — VERA CRUZ: Wartenberg, near Tantoyuca, 1858, *L. C. Ervendberg* 187 (G); Orizaba, *Botteri* 72 (G), 818 (BK), 821 (K); Cordoba, 825 m., 21 Aug. 1891, *Seaton* 441 (G); Valley of Cordova, 12 Dec. 1865, *Bourgeau* 1518 p. p. (GK); Mirador, *Liebmann* 10 (K); Mirador, July 1838, *Linden* 172 (K); Orizaba, 10 Apr. 1867, *Bimilek* 38 (K); Vera Cruz to Orizaba, *F. Mueller* 1875 (K); woods, temperate region (915–1525 m.), Jalapa, Aug. 1828, *Schiede & Deppe* (B); near El Estero, Mar. 1829, *Schiede & Deppe* (B); Cordoba, 24 Aug. 1882, *Kerber* 54 (BK); common weed in fields, Zacuapan, Nov. 1907, *Purpus* 2876 (G); Jalapa, 1220–1250 m., Jan. 1894, *C. L. Smith* 1658 (G); near Jalapa, 1220 m., 1 Apr. 1899, *Pringle* 7761 (G). YUCATAN AND TABASCO: *E. P. Johnson* 92 (K). Mexico without locality: *Pavon* (B); *Schmitz* (B). BRITISH HONDURAS: open ground near Manatee Lagoon, 21 Dec. 1905, *M. E. Peck* 242 (G); *E. J. F. Campbell* 32 (K). GUATEMALA: Coban, 1310 m., Aug. 1886, *Tuerckheim* 3 (G); Coban, 1877, *Tuerckheim* 3 (ed. C. Keck: BK); Coban, 1350 m., June 1906, *Tuerckheim* II. 1238 (G); sand bar in river, Agua Calientes, June 1909, *C. C. Deam* 6121(G); *Skinner* (K); Vera Paz, between San Cristobal and Santa Cruz, *Bernoulli* 1032 (K); Chojajá, near Majatenango, Oct. 1864, *Bernoulli* 92 (K). NICARAGUA: Graytown, *Tate* " 15 (30) " (BK); *Wright* (G). COSTA RICA: *Endres* 177 (K); prairies, San José, 1160 m., Sept. 1896, *Tonduz* 1552 (K); San José, 1160 m., Oct. 1908, *Tonduz* 17455 (G); Desamparados, July 1892, *Tonduz* 688 (G); Puerto Viejo, 1893, *P. Biolley* (*Pittier & Durand* 7413: B); 1000 m., near Alajuelita (?), 1894, *Tonduz* (*P. & D.* 8948: B); near Augistun, 6 Nov. 1875, *Polakowsky* 511 (B); Aug. 1875, *Polakowsky* 312 (B). PANAMA: *Seemann* 575 (B); Chagres, 3 Feb. 1850, *Fendler* 55 (G). CUBA: Pinales Lagunillas, Pinar del Rio, 14 Dec., *Wright* 1903 (BGK); without locality, *Wright* 1906 (BGK); *de la*

Sagra (K); river bank, Baracoa to Rio Guaba, Oriente, 14 Mar. 1910, *Shafer* 4305 (BG); San Diego de los Banos, Jan.–Feb. 1907, *Caldwell & Baker* 7007 (G). JAMAICA: *MacFadyen* (G); *March* (G); Cinchona, 1525 m., 18 Feb. 1900, *Clute* 193 (GK); Williams Ford, Nov. 1900, *Millspaugh* 1956 (G); Port Royal Mts., 1843, *Purdie* (K); Prospect Hill, 610 m., 1900, *W. J. Thompson* 7938 (BJ); Troy, 1906, *Harris* 9400 (BJK); Castleton, *Harris* 11 (J); Cinchona, 14 Oct. 1891, *W. Fawcett* (J); Scotts Hall, 1900, *W. J. Thompson* 7911 (J); Castleton district, 1898, *Harris* 7403 (J). SANTO DOMINGO: near Tarabacoa, Prov. de la Vega, 550 m., 1912, *Fuertes* 1629 (BG). PORTO RICO: Cataño, Bayamon, 1885, *Sintenis* 40d (GK); Maricao, 1884, *Sintenis* 40b (B); *Schomburgk* (K); *Heller* 90 (K), 550 (K). DOMINICA: near Rorehill, 500 m., 1881, *Eggers* 738 (K); *Imray* 361 (K); Laudat, 1903, *F. E. Lloyd* 46 (K); roadside between Prince Rupert and Douglas Bays, 3 July 1792, —— (K). MARTINIQUE: *von Rohr* (B); *Belanger* 16 (B); *Sieber* I. 175 (K). ST. LUCIA: *Anderson* (K). ST. VINCENT: rare, hillside near Kingstown, *H. H. & W. G. Smith* 1190 (G); *H. H. & W. G. Smith* 570 (BK). TRINIDAD: *Lockhart* (K); *Crueger* 201 (K). — T. 2. FIG. 77. — Doubtless some of the above-cited specimens in European herbaria belong to the next form.

Forma **leucoptera**. Flores albi. — VERA CRUZ: Orizaba, *Botteri* 430 (G). PORTO RICO: slopes of Mt. Mesa, Mayaquez, 14 Oct. 1884, *Sintenis* 40 (TYPE COLL.: BG); Jayco, 1880, *Garber* 76 (GK). GUADELOUPE: 1892, *Père Duss* 2420 (G). MARTINIQUE: La Chapella, May 1869, *Hahn* 124 (GK) and 126 (G).

Ser. ζ. INCARNATAE Chod. (restr.). Simple or sparsely branched annual, with cylindric racemes; aril large, membranous-cellular, equitant, unlobed. — *Polygala* sect. *Orthopolygala* subsect. I. E. *Incarnatae* Chod. Monog. ii. 185 (1893), as to *P. incarnata*. — Here restricted to *P. incarnata*, its only Mexican species, with which *P. setacea* Michx. should be included; the other species included by Chodat have a very different aril and doubtless should form a distinct series.

124. P. INCARNATA L. Simple or sparsely branched annual, about 3.5 dm. high, the stem slender, glabrous, somewhat glaucous, sulcate, sparsely leaved. Leaves scattered (the very lowest opposite or perhaps whorled), linear, acuminate, cuspidate, glabrous, glaucous, 1-nerved, not revolute, 4–6 mm. long, 0.3–0.6 mm. wide,

on petioles 0.5 mm. long. Racemes densely flowered, 0.6–3 (axis at length 3.8 cm.) long, 1–1.3 cm. thick in flower, 5.5–6 mm. in fruit, on peduncles 2–3.5 cm. long; pedicels 0.5 mm. long; bracts deciduous. Flowers rose-purplish, 7 mm. long. Upper sepal oblong-ovate, rounded to apex, broadly pinkish-bordered, serrulate on margin, 2.5 mm. long; lower lanceolate, subacuminate to the acute apex, serrulate, 2 mm. long. Wings linear-oblong, somewhat undulate-convolute on margin, slightly tapering at apex to an obtuse point or submucronulate, green-centered, pinkish-margined, not clawed, 3 mm. long, 0.6 mm. wide. Keel 7 mm. long, united with the staminal tube and upper petals into a trough 5 mm. long; crest of about 8 pairs of lobes, the posterior triangular-lanceolate, the 2 anterior longer, lanceolate, variously 2–3-lobed or cleft. Upper petals 6.7 mm. long, the free portion obovate-oval, erose at the truncate apex. Capsule suborbicular-ovate, cordate at base, barely stipitate, emarginate at apex, 2.4 mm long, 2 mm. wide. Seed plump, pilose, 2.2 mm. long. Aril 1.1 mm. long, membranaceous-cellular, erect. — L. Sp. ii. 701 (1753); Chod. Monog. ii. 189. t. 22. f. 16–18 (1893); Rob. in Gray, Syn. Fl. i. pt. 1. 455 (1897). *P. microphylla* A. W. Benn.! (sphalm.) in Hemsl. Diag. Pl. Nov. i. 2 (1878). *P. microptera* A. W. Benn.! Journ. Bot. xvii. 143 (1879). — VERA CRUZ: Jalapa, *Galeotti* 7096 (COTYPE COLL. of *P. microphylla* and *P. microptera:* K); savannas, Mirador, 1838, *Linden* 74 (COTYPE COLL. of *P. microphylla* and *P. microptera*: K); dry meadows, Zacuapan, Aug. 1906, *Purpus* 2072 (BG). — T. 2. FIG. 78. — Also in the United States.

Sect. 2. MONNINOPSIS Gray. Capsule 2-celled, the upper cell dehiscent between the narrow or rather broad wings, its seed arillate; lower cell usually indehiscent, wingless, its seed generally exarillate. — Gray, Pl. Wright. ii. 31 (1853). *Polygala* sect. *Orthopolygala* subsect. II. Chod. Monog. ii. 281 (1893). — Type species *P. hemipterocarpa* Gray.

a. Wingless cell of capsule broadly rugose . . . . . 125. *P. pterocarya.*
a. Wingless cell not rugose, *b.*
  b. Flowers violet . . . . . 131. *P. microloncha.*
  b. Flowers white (the veins often purplish), *c.*
    c. Flowers 3.5–5 mm. long, *d.*
      d. Stems finely incurved-puberulous . . . . . 129. *P. Watsoni.*
      d. Stems glabrous, *e.*
        e. Capsule exceeding wings . . . . . 127. *P. hemipterocarpa.*
        e. Capsule shorter than wings . . . . . 128. *P. macroloncha.*
    c. Flowers 1.5–3.5 mm. long, *f.*

f. Leaves obovate-spatulate . . . . . 137. *P. viridis.*
f. Leaves linear or acicular-linear, *g.*
g. Capsule 2½ times as long as wings . . . . . 126. *P. semialata.*
g. Capsule shorter, *h.*
h. Capsule oblong, about twice as long as wide, *i.*
i. Leaves strongly 2-sulcate beneath . . . . . 130. *P. scoparioides.*
i. Leaves not sulcate beneath, *j.*
j. Capsule 2 mm. long; aril 1 mm. long. 132. *P. dolichocarpa.*
j. Capsule 2.7–3 mm. long; aril 1.5 mm. long. 133. *P. scoparia.*
h. Capsule elliptic or suborbicular, not twice as long as wide, *k.*
k. Wings about equalling capsule . . . . . 134. *P. michoacana.*
k. Wings distinctly longer than capsule, *l.*
l. Lower sepals ovate, obtusish to acutish, not ½ as long as capsule . . . . . 135. *P. Salviniana.*
l. Lower sepals lanceolate, acuminate, more than ½ as long as capsule . . . . . 136. *P. oxysepala.*

125. P. PTEROCARYA Chod. Stems slender, diffuse, filiform, flexuous, 2 dm. long, thinly puberulent, from a perennial root Leaves subspreading, scarcely crowded, lance-linear, acute, apiculate, revolute, thin, 9–12 mm. long, 1–1.8 mm. wide, or smaller. Racemes becoming elongate, with sinuate rachis, cylindric-pyramidal, 1.5–2 cm. long, 7–8 mm. thick, rather dense, scarcely comose at apex; pedicels 0.6 mm. long. Flowers 3–3.5 mm. long. Sepals ovate, the lower acute, less than half as long as the flower. Wings exceeding corolla, subspatulate, gradually narrowed to base, shortly acute, 3-nerved. Crest of a few rather broad processes. Capsule strongly inequilateral, one cell broadly winged, the wing sinuate, veiny, the other cell narrower, wingless, broadly rugose. Seed curved, sparsely pilose; lobes of aril linear, membranaceous, descending, 3/4 as long as seed. — Chod. Bot. Jahrb. lii. Beibl. 115. 83 (1914), as *P. pterocaryum.* — Based on *Seler* 1462, San Cristobal Amoltepec, Oaxaca. — Not seen; description compiled.

126. P. SEMIALATA Wats. Stems numerous from a fruticulose base, erect or lax, branched, very slender, almost filiform, sparsely and very minutely incurved-puberulous, 8–21 cm. long. Leaves linear, acuminate at both ends, mucronulate, slightly thickened, slightly concave above, 1-nerved and convex beneath, glabrous or microscopically incurved-puberulous, 4.8–8.5 mm. long, 0.5–1 mm. wide, on petioles 0.4 mm. long or less. Racemes terminating stems and branches, 15–22-flowered, 3–12.5 cm. long. Flowers whitish, purplish-green-veined, 1.5–1.7 mm. long. Upper sepal orbicular, the lower oval, round-tipped, greenish, glabrous, 0.6 mm. long.

Wings oval-obovate, rounded at apex, cuneate at base, glabrous, 3-nerved, 1.4 mm. long, 0.8 mm. wide. Keel glabrous, 1.7 mm. long; crest of about 3 pairs of lobes. Upper petals oblong, rounded at apex, 1.5 mm. long. Capsule narrowly oblong, curved, rounded at each end, 3.6 mm. long, 1.3 mm. wide, the upper cell larger, distinctly winged, the lower wingless, indehiscent. Seed cylindric, curved, black, finely pilosulous, 2.5 mm. long. Aril 1.7 mm. long, the corneous umbo minute, the 2 scarious lateral lobes appressed. — Wats.! Proc. Am. Acad. xvii. 326 (1882); Chod. Monog. ii. 286. t. 26. f. 10–11 (1893). — NUEVO LEON: Monterey, Feb. 1880, *Palmer* 67 (TYPE COLL.: GK). — T. 2. FIG. 79.

127. P. HEMIPTEROCARPA Gray. Stems several, sparsely branched, erect from a fruticulose base, sulcate, very glabrous and slightly glaucous, 1.2–5.6 dm. high. Leaves linear, acute or subacuminate, mucronate, obtuse at base, thickish, flattish above, beneath convex, 1-nerved, scarcely sulcate, glabrous, 6–23 mm. long, 0.6–1 mm. wide, on petioles 0.5 mm. long or less. Racemes 3–21 cm. long, many-flowered. Flowers white, greenish-veined, 3.5–4 mm. long. Upper sepal oval, the lower ovate, all obtuse, 1.6–(upper) 2.3 mm. long. Wings obovate, rounded at apex, 5-nerved, glabrous, 3.5–4 mm. long, 1.6–1.8 mm. wide. Keel 3.4 mm. long; crest of about 3 pairs of 2–4-lobed processes. Upper petals oblong, rounded at apex, 3.1 mm. long. Capsule oblong, 5 mm. long, 2.3 mm. wide, the upper cell longer, broadly erose-scarious-winged, the lower wingless, filled by the seed. Seed short-silky-pilosulous, 2.7 mm. long. Aril (of seed in winged cell) 2 mm. long, the scarious lobes linear, appressed; of seed in wingless cell obsolescent. — *P.* (*Monninopsis*) *hemipterocarpa* Gray! Pl. Wright. ii. 31 (1853); Chod. Monog. ii. 281. t. 26. f. 1–2 (1893); Rob. in Gray, Syn. Fl. i. pt. 1. 453 (1897). — CHIHUAHUA: near Colonia Garcia, Sierra Madre, 2285 m., 16 June 1899, *Townsend & Barber* 37 (BGK). Also in Texas, Arizona, and New Mexico.

128. P. MACROLONCHA Chod. Stems slender, striate, green, glabrous, denudate below, leafy above, from a suffruticulose base. Leaves linear-acicular, erect, acute at each end, glabrous, 9–10 mm. long, 1–1.5 mm. wide or smaller. Racemes terminal, scarcely loosely flowered, 1.5–2 cm. long, 7 mm. thick; bracts quickly caducous, the middle one acicular, 1.3 mm. long; pedicels 0.5 mm. long. Flowers white, 4.5 mm. long. Upper sepal ovate, shortly

acute, the lower much narrower, glabrous. Wings conspicuously longer than corolla, spatulate, subobtuse or shortly acute, gradually clawed at base, 3-nerved, the nerves simple. Limb of keel shorter than claw; crest of 2 lamellae and 4–5 narrower lobes, more or less incised or entire. Capsule rather shorter than wings, elliptic, narrowly subserrulate-winged on one side. Seed oblong, appressed-pilose, subcornute at apex, curved, the aril-lobes linear, membranaceous, descending, 2/3 as long as seed. — Chod. Bot. Jahrb. lii. Beibl. 115. 84 (1914), as *P. macrolonchum*. — Based on *Seler* 2925, from grassy places, Zaragoza, Chimaltenango, Guatemala. — Not seen; description compiled.

129. P. Watsoni Chod. Stems numerous, branched, ascending from a thick woody base, 3.5 dm. long or less, finely incurved-puberulous. Leaves crowded, linear-acicular, acuminate at each end, obliquely mucronate, glabrous, flattish above, strongly 2-sulcate beneath, 4–11 mm. long, 0.4–0.6 mm. wide, on incurved-puberulous petioles 0.5 mm. long. Racemes about 10-flowered, 6–10 mm. long, 8–10 mm. thick. Flower white with pale veins, 5 mm. long. Sepals oblong, abruptly acutish, denticulate toward apex, glabrous, 2 mm. long. Wings obovate, cuneate at base, mucronate at the obtuse apex, glabrous, 3–sub-5-nerved, 5 mm. long, 1.8 mm. wide. Keel 3.5 mm. long; crest of 2 pairs of lobes, the posterior adnate, cuneate, entire, the anterior oblong-spatulate, erect, bifid. Upper petals oblong-oval, rounded at apex, 3.2 mm. long. Capsule elliptic, narrow-margined on both cells (both cells dehiscent), glabrous, 3 mm. long, 2 mm. wide. Seed cylindric, curved, blackish, 2.6 mm. long. Aril 1.8 mm. long, with minute umbo and appressed linear scarious lobes. — Chod.! Monog. ii. 285. t. 26. f. 8–9 (1893). *P. acicularis* Wats.! Proc. Am. Acad. xxi. 445 (1886), not Oliv. Fl. Trop. Afr. i. 132 (1868). — Chihuahua: calcareous ledges and banks, Santa Eulalia Mts., 1 May 1885, *Pringle* 233 (type coll.: G); *Pringle* 713 (K). — T. 2. Fig. 80. — The type number was cited by Dr. Watson and by Pringle in litt. as 233, but on the label of the specimen in the Gray Herbarium is printed 223, doubtless by error. A later collection from the same locality, more widely distributed by Pringle, is numbered 713.

130. P. scoparioides Chod. Stems very numerous, angulate, finely incurved-puberulous, 0.9–3 dm. high, slightly glaucescent. Leaves linear-acicular, acute to acuminate at each end, obliquely

mucronate, more or less strongly 2-sulcate beneath, glabrous or nearly so, 7–14 mm. long, 0.6–1.3 mm. wide, on petioles 0.4 mm. long or less. Racemes up to 36-flowered, 1.5–7.8 cm. long. Flowers 2.5–3 mm. long, white, greenish-veined. Sepals oblong-ovate, rounded at apex, glabrous, 1.3 mm. long. Wings spatulate-obovate, barely mucronulate at the obtuse (apparently, by inflection, acute) apex, 5-nerved, glabrous, 2.6–3 mm. long, 1.3–1.6 mm. wide. Keel 2.8 mm. long; crest weakly 3-lobed on each side. Upper petals oblong-oval, rounded at apex, 2.8 mm. long. Capsule oblong-elliptic, barely emarginulate, very narrowly winged on upper side, 3–3.5 mm. long, 1.6 mm. wide, the upper cell slightly the longer, both dehiscent. Seeds subcylindric, straight, 2.5–3 mm. long, black, subsparsely puberulous. Aril 1–1.9 mm. long. — Chod.! Monog. ii. 284. t. 26. f. 6–7 (1893). *P. scoparia* of most auth., at least in part, not HBK. *P. scoparia* HBK. var. *multicaulis* Gray! Pl. Wright. i. 38 (1852). *P. Wrightii* Gray ex A. W. Benn. Journ. Bot. xvii. 205 (1879), as syn. *P. scoparia* var. *multicaulis*. — Sonora: Pine Mesa, 2135 m., 19 Dec. 1890, *Hartman* 352 (G); between San Pedro and Fronteras, Sept. 1890, *Hartman* 914 (G). Coahuila: mountains east of Saltillo, Apr. 1880, *Palmer* 69 (GK); Saltillo, May 1898, *Palmer* 115 (G); Sierra de Parras, Mar. 1905, *Purpus* 1037 (BG). San Luis Potosi: San Miguelita Mts., 4 Aug. 1877, *Schaffner* 2 (G). Also Texas: *Vasey*, *Jones* 3774, *Thurber* 168, *Wright* 100 (type of *P. scoparia* var. *multicaulis*: G), 934; and Arizona: foothills of the Santa Rita Mts., 25 June 1884, *Pringle* (type coll.: GK); Rincon Mts., *Lemmon*. — T. 2. Fig. 81. — For a discussion of the marks of distinction between this species and its near relative *P. scoparia*, with which it has been much confused, see no. 133.

131. P. microloncha Chod. Stems virgate, striate, angled, glabrous, 3 dm. long, denudate below, leafy and corymbosely branched above, from a persistent root. Leaves acicular, acute, glabrous, 7–10 mm. long, 1 mm. broad, or less. Racemes terminal, loosely flowered, very slender toward apex, 5–9 cm. long; pedicels 1 mm. long. Flowers (rosy) violaceous, 3–3.5 mm. long. Sepals ovate, acute, narrow, glabrous. Wings elliptic-spatulate, clawed, the limb oblong, 3-nerved, longer than corolla. Crest of about 3 pairs of linear lobes and 2 triangular lamellae. Capsule longer than the wings, oblong-elliptic, inequilateral, on one wide very narrowly

winged, conspicuously nervose, 3.5 mm. long. Seed cylindric, barely curved. Lobes of aril linear, membranaceous, sinuate, 1/3 as long as seed. — Chod. Bot. Jahrb. lii. Beibl. 115. 84 (1914), as *P. microlonchum*. — Based on *Seler* 3138, from lightly wooded limestone hills, Chaculá-Uaxac Canal, Huehuetenango, Guatemala, and *Seler* 3123. — Not seen; description compiled.

132. P. **dolichocarpa,** sp. nov. Caules plures basi suffruticulosi e radice lignosa simplices vel sparsissime ramosi 1–3.5 dm. alti sulcati sparse minutissime incurvo-puberuli mox denudati. Folia linearia acuminata cuspidulata crassiuscula glabra supra planiuscula subtus convexa evenia 3–4.5 mm. longa 0.3 mm. lata. Racemi demum 5–10 cm. longi laxe multiflori. Flores albi purpurascenti-venosi 2.7–3.2 mm. longi. Sepala ovata medio purpurascentia superius obtusum 1.4 mm. longum, inferiora mucronulata vel acuta 1–1.2 mm. longa. Alae spathulato-obovatae obtusae basi paullum obliquae glabrae 3–sub-5-nerviae 2.7–3.2 mm. longae 1.1–1.3 mm. latae. Carina 2.6 mm. longa; crista e lobis ca. 4-jugis oblongis integris vel 2–3-lobatis constans. Petala superiora oblonga apice rotundata 2.2–2.3 mm. longa. Capsula oblonga 2 mm. longa 1 mm. lata, loculo postico paullo longiore dehiscente angustissime alato, antico indehiscente immarginato. Semen (e loc. post.) cylindricum breviter pilosulum 1.5 mm. longum, arillo 1 mm. longo, lobis 2 lateralibus scariosis linearibus appressis; semen (e loc. antico) simile sed arillo deficiente. — San Luis Potosi: Minas de San Rafael, May 1911, *Purpus* 5566 (type coll.: BG); Bagre, Minas de San Rafael, May 1911, *Purpus* 5165 p. p. (BG). — T. 2. Fig. 83.

133. P. scoparia HBK. Fruticulose, the stems numerous, fascicled from a woody root, branched, slender, striate, finely incurved-puberulous, 7.5–13 cm. long. Leaves rather crowded, linear-acicular, acuminate to the cuspidate apex, coriaceous, 1-nerved but not sulcate beneath, glabrous or very sparsely incurved-puberulous, subsessile by a pale slightly narrowed base, 5–9 mm. long, 0.4–1 mm. wide. Racemes terminal, densely flowered or loose below, 0.5–2.3 cm. long. Flowers white, the wings green or purplish-maroon along the midline, 2.6–2.9 mm. long. Sepals oval or ovate, obtuse to subacute, with green or purplish central line and white border, 0.9–1 mm. long. Wings obovate, barely mucronulate at the obtuse (by inflexion apparently acute) apex, cuneate at base,

glabrous, 2.9 mm. long, 1 mm. wide. Keel 2.3 mm. long; crest about 4-lobed on each side. Upper petals oblong, rounded at apex, subequal to keel. Capsule oval-oblong, the upper cell slightly the longer, narrowly winged, the lower wingless, scarcely dehiscent, 2.7–3 mm. long, 1.5–1.6 mm. wide. Seed cylindric, shortly pilosulous, 2.2–2.5 mm. long. Aril 1.5 mm. long, with minute umbo, the 2 linear lobes entire, scarious, appressed. — HBK.! Nov. Gen. v. 399 (1821); Chod. Monog. ii. 282. t. 26. f. 3–5 (1893); of other auth. only in part. *P. flagellaria* Pavon! and *P. filiformis* Pavon ex Chod. l. c., as syn. — VERA CRUZ: Valley of Cordova, 12 Dec. 1865, *Bourgeau* 1518 p. p. (G). MEXICO: Tacubaya, Valley of Mexico, 27 May 1865, *Bourgeau* 60 (GK); Valley of Mexico, *Schaffner* 32 (GK), 37 (K); near City of Mexico, *Humboldt & Bonpland* (fragm. of TYPE: G).—T. 2. FIG. 82.—Nearly all the material that has been distributed as *P. scoparia* proves on close study to be referable to *P. scoparioides* Chod. (no. 130). True *P. scoparia*, very similar in aspect to *P. scoparioides* but with leaves not sulcate beneath, narrower wings, and short capsule equalling or barely exceeding the wings, appears to be confined to the Valley of Mexico so far as known at present. All the United States material referred to *P. scoparia* is *P. scoparioides*. The root is used officinally by the Mexicans, according to Schaffner.

134. P. MICHOACANA Rob. & Seaton. Similar in habit, pubescence, and leaves; leaves up to 1.5 mm. wide. Raceme 0.7–4.2 cm. long, loosely or densely flowered; flowers colored as in the last. Sepals ovate, acutish, 1 mm. long. Wings cuneate-obovate, obtuse, 2.5 mm. long, 1 mm. wide. Keel 2 mm. long. Capsule suborbicular, 2–2.5 mm. long, 1.5–1.8 mm. wide. Seed (of both cells the same) 1.7–2 mm. long, short-pilose. Aril 1.2–1.8 mm. long, the lobes linear-oblong, scarious, appressed. — Rob. & Seaton! Proc. Am. Acad. xxviii. 103 (1893); Chod. Bull. Herb. Boiss. iv. 901 (1896), as syn. *P. scoparia* HBK. — SAN LUIS POTOSI: 1830–2440 m., 1878, *Parry & Palmer* 45 (G). HIDALGO: Cerro Ventoso above Pachuca, 2650 m., 18 Aug. 1898, *Pringle* 6968 (BGK). MICHOACAN: amongst pines, hills of Patzcuaro, 7 Aug. 1892, *Pringle* 4151 (TYPE COLL.: BGK). MEXICO: prairies, Flor de Maria, 31 July 1890, *Pringle* 3618 (G). PUEBLA: Mt. Orizaba, 2745 m., 9 Aug. 1891, *Seaton* 508 (G); Esperanza, Sept. 1911, *Purpus* 5705 (BG). —T. 2. FIG. 84.

135. P. Salviniana A. W. Bennett. Similar in habit, inflorescence (1.7 cm. long or less), pubescence, and leaves; stems 1 dm. long or less. Flowers apparently always with green not purple midribs, 3 mm. long. Sepals ovate, obtusish to acutish, 0.9 mm. long. Wings obovate, obtuse (apparently acute by inflexion), 3 mm. long, 1.2 mm. wide. Keel 1.5 mm. long. Capsule elliptic, very narrowly winged, 2.3 mm. long, 1.5 mm. wide. Seed oblong, puberulous, 2 mm. long. Lobes of aril oblong, 1.2 mm. long. — A. W. Benn.! Journ. Bot. xvii. 203 (1879); Chod. Monog. ii. 288 (1893). — Guatemala: ridge above Calderas, 2530 m., 20 Oct. 1873, Salvin (cotype: K); grassy places, Llano de la Laguna de Ayarces, July 1870, *Bernoulli* 695 (cotype: K).

136. P. **oxysepala,** sp. nov. Fruticulosa pluricaulis caulibus tenuibus sparse minute strigillosis vel incurvo-puberulis ramosis adscendentibus 5–35 longis. Folia linearia acuminata mucronata 1-nervia crassiuscula subsessilia subglabra vel sparse incurvo-puberula 5–13 mm. longa 0.8–1 mm. lata. Racemi laxi- vel subdensiflori demum 6 cm. longi. Sepala ovato-lanceolata acuminata plus minusve inflexa medio viridia albo-marginata 1.5–1.8 mm. longa. Alae spathulato-obovatae apice obtusae late albo-marginatae 3–3.5 mm. longae 0.8–1.3 mm. latae. Carina 1.5 mm. longa. Capsula elliptica loculo postico angustissime alato 2.6 mm. longa 1.5 mm. lata. Semen oblongum teres breviter pilosum 2 mm. longum. Arillus 1.2–1.5 mm. altus, umbone minimo lobis 2 lateralibus oblongis appressis scariosis. — Guatemala: San Miguel Uspantán, Dept. Quiché, 1830 m., Apr. 1892, *Heyde & Lux* 3005 (GK); Santa Rosa, Dept. Baja Verapaz, 1525 m., Apr. 1887, *Tuerckheim* 1202 (type coll.: GK). — T. 2. Fig. 85.

137. P. viridis Wats. Several-stemmed, suffruticulose, the stems subsimple or branched, spreading, rather densely puberulous with very short wide-spreading hairs, 5.5–11 cm. long. Leaves obovate-spatulate, acutish at the mucronate apex, long-cuneate at base, coriaceous, 1-nerved, scarcely revolute, sparsely spreading-puberulous, 5–11 mm. long, 1.5–3.6 mm. wide. Racemes loosely flowered, 1–2.5 cm. long. Upper sepal oval, the lower ovate, obtuse, herbaceous with very narrow white border, 1 mm. long. Wings obovate, obtuse, not involute, green with narrow white margin, 2.6 mm. long, 0.9 mm. wide. Keel 2.3 mm. long; crest of 2 pairs of lobes, the posterior adnate, the anterior bifid. Upper petals

oblong, not dilated, 2 mm. long. Capsule oval-oblong, narrowly winged on upper side, 2.8 mm. long, 1.5 mm. wide. Seed puberulous, 2 mm. long. Aril 1.2 mm. long, its lobes linear-oblong. — Wats.! Proc. Am. Acad. xvii. 325 (1882). — COAHUILA: Caracol Mts., 32 km. S. E. of Monclova, Aug. 1880, *Palmer* 2013 (TYPE COLL.: GK). — Omitted from Chodat's revision. The type is wrongly cited by Watson as *Palmer* 2113.

SPECIES DUBIAE VEL EXCLUDENDAE

Badiera Berteriana Spreng. Sys. iii. 172 (1826). "Hispaniola," *Bertero.* Not identifiable.

Polygala acuminata Willd. Sp. iii. 887 (1803). *Badiera acuminata* (Willd.) DC. Prod. i. 335 (1824). South American; see Chod. Monog. ii. 46 (1893).

P. adenophora DC. Prod. i. 327 (1824). Recorded by Bennett, Journ. Bot. xvii. 171 (1879). South American; the Trinidad species is *P. exserta* Blake.

P. adenophylla St. Hil. Fl. Bras. Merid. ii. 20 (1829). Recorded by Bennett, l. c. 202 (1879). The specimen (*Galeotti* 876) is *P. subalata* Wats.

P. americana Mill. δ. *angustifolia* (HBK.) Ktze. f. *viridula* Ktze. Rev. i. 48 (1891). Quid ?

P. axillaris Poir. Ency. v. 489 (1804), described as from the Antilles, is an Indian species of *Floscopa* (*F. axillaris* (Poir.) Clarke in DC. Monog. Phan. iii. 268 (1891)).

P. baccifera Sess. & Moc. Pl. Nov. Hisp. 114 (1887), as *Poligala baccifera* = *Monnina* sp., ex char.

P. Berteriana DC. Prod. i. 328 (1824). Santo Domingo, *Bertero.* According to St. Hilaire (Fl. Bras. Merid. ii. 22 (1829)), who has examined the type, it is *P. hygrophila* HBK.

P. Boykinii Nutt. Journ. Acad. Nat. Sci. Phila. vii. 86 (1834). Recorded by Bennett, l. c. 202 (1879), and Hemsley, Biol. Centr.-Am. Bot. i. 58 (1879). Hemsley's specimens are in part *P. subalata* Wats. (*Ghiesbreght, Galeotti* 876, *F. Mueller* 999) and in part *P. aparinoides* H. & A. (*Bernoulli* 662). Other specimens cited have not been examined by the writer. See Watson, Proc. Am. Acad. xxi. 416 (1886).

P. calvipes Schlecht. Linn. xiv. 160 (1840). "In Mexico ? (hb. Lehmann)." Apparently a member of the subsect. *Hebantha* of

Hebecarpa, but the description (" capsula . . . glaberrima ") does not apply to any known species of that group.

P. capitata Sess. & Moc. Fl. Mex. II. ed. 163 (1894). Undeterminable.

P. chinensis L. Sp. i. 704 (1753). In Fl. Jam. 381 (1759) and in later publications Linnaeus included Patrick Browne's *Polyala* no. 4 (Nat. Hist. Jam. 287 (1756)) under this species. It was undoubtedly *P. jamaicensis* Chod.

P. Conzattii Gand. Bull. Soc. Bot. Fr. lx. 454 (1913), not Rose, Contr. U. S. Nat. Herb. xiii. 307 (1911). This species, based on *Conzatti & González* 152, from Oaxaca, belongs to sect. *Euhebecarpa*, but is not determinable from description.

P. cruciata L., recorded by Bennett, l. c. 202 (1879), and *P. cruciata* forma *parva* A. W. Benn. ex Hemsl. l. c. 59 (1879), nomen, are *P. conferta* A. W. Bennett.

P. diversifolia L.! Sp. ii. 703 (1753) is *Securidaca volubilis* L.

P. domingensis Bert. ex Spreng. Sys. iii. 172 (1826) as syn. *Badiera Berteriana* Spreng., q. v.

P. galioides Poir. Ency. v. 503 (1804). Recorded by Hemsl. l. c. 59 (1879), whose specimens are *P. turgida* Rose and *P. subalata* Wats. (*Parry & Palmer* 39½) and *P. aparinoides* H. & A. (*Beechey, Salvin & Godman*).

P. guatemalensis Gand. Bull. Soc. Bot. Fr. lx. 454 (1913), not A. W. Benn. (1895), based on *Tuerckheim* an. 1906, from Alta Verapaz, is probably *P. costaricensis* Chod.

P. hebecarpa DC. Prod. i. 330 (1824). *P. americana* Mill. β. *hebecarpa* (DC.) A. W. Benn. Journ. Bot. xvii. 139 (1879), as to syn. Santo Domingo, *Nectoux*. Considered by De Candolle as perhaps referable to *P. ovata* Poir., but referred by Chodat to *P. caracasana* HBK. If indeed identical with *P. ovata* as suggested by De Candolle, the species cannot be the same as *P. caracasana*.

P. inaequiloba Turcz. Bull. Soc. Nat. Mosc. xxvii. no. 2. 349 (1854), based on *Galeotti* 877 *bis*, is still dubious.

P. mexicana DC. Prod. i. 333 (1824). Based on a plate in the inedited Fl. Mex. of Mociño & Sesse (Calq. Dess. t. 40) which is almost certainly *P. scoparia* HBK.

P. minutiflora Presl, Rel. Haenk. ii. 100 (1835–36). A still doubtful species.

P. nemoralis A. W. Benn. Journ. Bot. xvii. 172 (1879). Based on three collections, the two Mexican and Central American being

P. aparinoides H. & A., the third, *Mandon* 839, to which the name must be restricted, a distinct Bolivian species.

P. nutkana Moc. ex DC. Prod. i. 330 (1824); A.DC. Calq. Dess. t. 39. A very dubious species, perhaps Mexican. See Robinson in Gray, Syn. Fl. i. pt. 1. 449 (1897).

P. ovata Poir. Ency. v. 498 (1804). Belonging to subsect. *Hebantha* of *Hebecarpa*, but not identifiable from description.

P. platycarpa Benth. Recorded by Bennett, l. c. 139 (1879). I have not seen his specimens (*Liebmann* 32–35, *Galeotti* 881). Hemsley and Chodat both erroneously accredit the original Hartweg specimens (from Guayaquil) to Mexico.

P. pubescens Schlect. Linn. xiv. 160 (1840), not Mart. nor Muhl., nomen, = *P. grandiflora* Walt. var. *leptophylla* Chod. ?

P. pubescens Gray var. *gracilis* Chod. Monog. ii. 22 (1893). Not seen; based on *Galeotti* 898.

P. pulchella Schlecht. & Cham. Linn. v. 230 (1830), not St. Hil. (1829); Chod. Monog. ii. 15 (1893). "Inter Marantial et Paso de Ovejas," Vera Cruz, *Schiede & Deppe*. A still doubtful species.

P. quadrangula Presl. Rel. Haenk. ii. 100 (1835–36). A species of *Orthopolygala*, perhaps *P. scoparioides* Chod.

P. spergulaefolia St. Hil. Fl. Bras. Merid. ii. 28 (1829). Recorded (as a synonym of *P. glochidiata* HBK.) by Bennett, Journ. Bot. xvii. 202 (1879). True *P. spergulaefolia* is a South American species or variety of *P. glochidiata* HBK.

P. strigulosa Schlecht. Linn. xiv. 160 (1840). A doubtful species, perhaps *P. obscura* Benth.

P. tenella Willd. Sp. iii. 878 (1803). Perhaps *P. paniculata* L. Referred by Chodat (l. c. 499 (index)) to *P. Funkii* Chod.

P. trichosperma L. Sys. XII. ed. iii. 232 (1768). South American; Hemsley's and Bennett's (l. c. 171, 202) records under this name refer to *P. longicaulis* HBK.

P. velutina Presl, Rel. Haenk. ii. 100 (1835–36). Belonging to the subsect. *Hebantha* of *Hebecarpa*, but not determinable from description.

P. verticillata L. Sp. ii. 706 (1753). Recorded from Mexico by Bennett (l. c. 202 (1879)) and Hemsley (l. c. 62). The *Bernoulli* specimen is *P. aparinoides* H. & A.; *Botteri* 820 is *P. glochidiata*; *Seemann* 2153 is *P. alba* Nutt. var. *suspecta* Wats.

P. vulgaris Sess. & Moc. Pl. Nov. Hisp. 114 (1887), not L. Indeterminable.

LIST OF EXSICCATAE CITED.

Distribution numbers are in full-face type. The numbers in parentheses are species numbers of the present revision. Collections distributed without number are indicated by a dash.

Alexander — (8).
Anderson — (123*a*).
Anthony — (77).

Baites — (49 ?).
Baker & Alarca 4330 (121).
Barclay 2123 (113*a*); **2647** (57).
Barnes & Land 235 (121).
Beechey — (103); — (106*a*).
Belanger 16 (123*a*); **621** (41).
Berlandier 721, 2138 (114).
Bernoulli 92 (123*a*); **105** (100); **120** (63); **662** (103); **696** (113*a*); **695** (135); **998** (85); **1019** (103); **1032** (123*a*); **1092** (66); **1102** (119).
Bernoulli & Carlo 3191 (85); **3218** (66); **3233** (103).
Bimilek 38 (123*a*).
Biolley 7413 (123*a*).
Blumer 1337 (32*a*); **3336** (106*β*).
Botteri 72 (123*a*); **430** (123*β*); **818** (123*a*); **819** (121); **820** (113*a*); **821** (123*a*); **822** (100); **823** (114); **829, 1118** (121); **1119** (114); **1120** (113*a*).
Bourgeau 60 (133); **477** (38); **1518** p. p. (123*a*), p. p. (133); **3249** (100).
Brace 158 (5).
Brandegee 20 (114); **23** (77); — (77); — (96); — (110); — (113*a*).
Britton 2086 (4).
Britton, Britton, & Marble 2228 (2).
Britton, Cowell, & Brown 4349 (7).
Britton, Cowell, & Shafer 12981, 13063 (1*a*).
Britton & Fishlock 948 (107).
Britton & Millspaugh 2369, 3130 (98).
Britton & Wilson 5461 (10).
Broadway 1818, 4252 (85).
Browne — (8).

Caldwell & Baker 7007 (123*a*).
Campbell 32 (123*a*).
Clute 193 (123*a*).
Combs 213 (85); **442** (116).
Conzatti 205 (32*β*); **1587** (21).
Conzatti & González 335 (32*β*); **1186** (114).
Coulter 725 (106*a*); **727** (113*a*); **728** p. p., **729** p. p. (37); **732** p. p. (54), p. p. (55).
Crueger 201 (123*a*); — (85); — (112); — (116); — (117).
Curtiss 358 (121); **514** (116); **717** (1*a*).

Davidson — (89).
Deam 99 (118*β*); **6121** (123*a*).
Dugès — (106*a*).
Duss 2420 (123*β*); **2981** (88).

Edwards & Eaton 53 (92); — (14).
Eggers 738 (123*a*); **1890** (84*a*); **1897** (3); **2364** (84*a*); **4450** (80); — (85).
Endres 177 (123*a*).
Ervendberg 187 (123*a*).

Fawcett — (123*a*).
Fendler 55 (123*a*); **267** (117); **269** (112); **271** (85).
Fish — (89).
Friedrichsthal — (57 ?).
Fuertes 1065 (13); **1557** (84*a*); **1629** (123*a*).

Galeotti 876 (105); **879** (65); **883** (32*a*); **899** (23); **7036** (116); **7096** (124).
Garber 76 (123*β*).
Ghiesbreght 22 (74); **736** (44); **737** (74); **861** (122); **875** (47); **879** (46); — (43); —(105).
Goodding 791 (32*a*).
Greene — (32*a*).
Gregg 371 (106*a*); — (68).
Groth 163 (92).

Haenke — (118*a*).
Hahn 124, 126 (123*β*).
Hall (E.) 96 (92).

Harris 11 (123*a*); **5838, 6597** (8); **6904** (85); **7092** (8); **7403** (123*a*); **8153** (85); **9400** (123*a*); **9651** (8).
Hart 641 (8).
Hartman 40 (106*a*); **148** (113*a*); **352, 914** (130).
Hartweg 30 (106*a*); **446** (32*a*); **447, 572** (74).
Havard 100 (92).
Hayes — (58); — (63).
Heatslet — (2).
Heller 90, 550 (123*a*).
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EXPLANATION OF PLATES

(The figures represent mature seeds (except in a few specified cases) drawn from the material specified, and enlarged x 5, except figures 70 a, 72 a, 73 a, 74 a, and 75 a, which are enlarged to various scales.)

Tab. 1

Fig. 1. *P. cuneata* (Griseb.) Blake forma *obovata* (Griseb.) Blake (drawn from *Wright* 1917). Aril not shown.

2. *P. Penaea* L. (*Eggers* 1897).
3. *P. jamaicensis* Chod. (*March* 1656).
4. *P. stipitata* Blake (*Wright* 1913 p. p.).
5. *P. propinqua* (Britton) Blake (*Wright* 1913 p. p.).
6. *P. ovatifolia* Gray (*Wright* 103).
7. *P. buxifolia* HBK. (*Schaffner* 7 p. p.).
8. *P. myrtilloides* Willd. (*Schaffner* 7 p. p.).
9. *P. Robinsonii* Blake (*Pringle* 4472).
10. *P. serpens* Blake (*Palmer* 168).
11. *P. Barbeyana* Chod. (*Schaffner* 3). Immature.
12. *P. reducta* Blake (*Parry & Palmer* 44).
13. *P. intricata* Blake (*Palmer* 165 1/2).
14. *P. rectipilis* Blake (*Metcalfe* 1274).
15. *P. Palmeri* Wats. (*Palmer*).
16. *P. racemosa* Blake (*Pringle* 572).
17. *P. longa* Blake (*Wright* 936 p. p.).
18. *P. obscura* Benth. var. *genuina* Blake (*Wright* 104).
19. *P. obscura* Benth. var. *euryptera* Blake (*L. C. Smith* 80).
20. *P. Lozani* Rose (*Pringle* 7477).
21. *P. brachyanthema* Blake (*Purpus* 5169). Immature.
22. *P. oophylla* Blake (*Purpus* 3921).
23. *P. Brandegeeana* Chod. (*Purpus* 1429).
24. *P. compacta* Rose (*Parry & Palmer* 42 1/2).
25. *P. pedicellata* Blake (*Purpus* 6308).
26. *P. Albowiana* Chod. (*Pringle* 3876).
27. *P. velata* Blake (*Ghiesbreght* 879).
28. *P. microtricha* Blake (*Coulter* 732 p. p.).
29. *P. Hayesii* Blake (*Hayes*). Immature.

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31. *P. isotricha* Blake (*Bernoulli & Cario* 3218).
32. *P. cuspidulata* Blake (*Purpus* 2764).

33. *P. consobrina* Blake (*J. D. Smith* 1980).
34. *P. jaliscana* Blake (*Palmer* 417).
35. *P. hebantha* Benth. (*Barclay* 2647).
36. *P. chiapensis* Blake (*Galeotti* 736).
37. *P. biformipilis* Blake (*Purpus* 2364).
38. *P. appressipilis* Blake (*Pringle* 11925). Very immature.
39. *P. floribunda* Benth. (*Heyde & Lux* 4313).
40. *P. tonsa* Blake (*Heyde & Lux* 3067).
41. *P. phoenicistes* Blake (*Purpus* 5166). Immature.
42. *P. macradenia* Gray var. *genuina* Blake (*Purpus* 4759).
43. *P. Parryi* A. W. Bennett (*Schaffner* 6).
44. *P. tehuacana* Brandegee (*Purpus* 5706).
45. *P. angustifolia* HBK. (*Combs* 213).
46. *P. Planellasi* Molt. & Gomez (*Duss* 2981).
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48. *P. lithophila* Blake (*Purpus* 5171).
49. *P. nitida* Brandegee (*Purpus* 5168).
50. *P. Lindheimeri* Gray (*Wright*).
51. *P. blepharotropis* Blake (*Thurber* 1090).
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69. *P. brachyptera* Griseb. (*Wright* 1912).
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83. *P. dolichocarpa* Blake (*Purpus* 5165 p. p.). Seed from lower cell of capsule.
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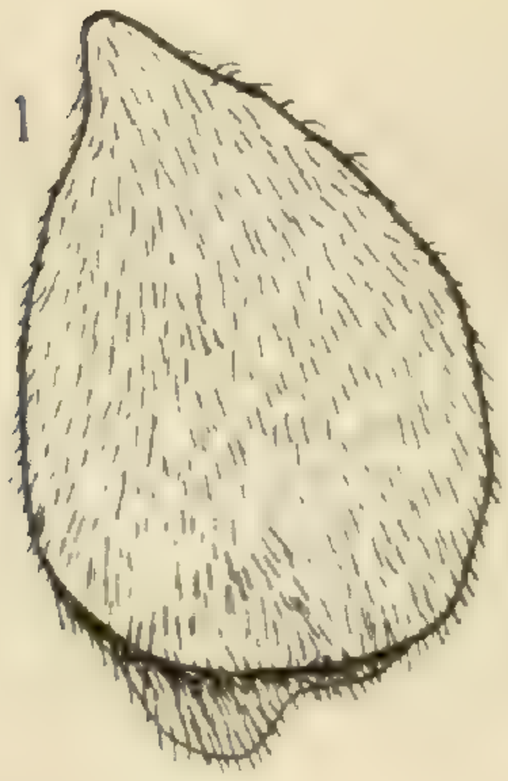

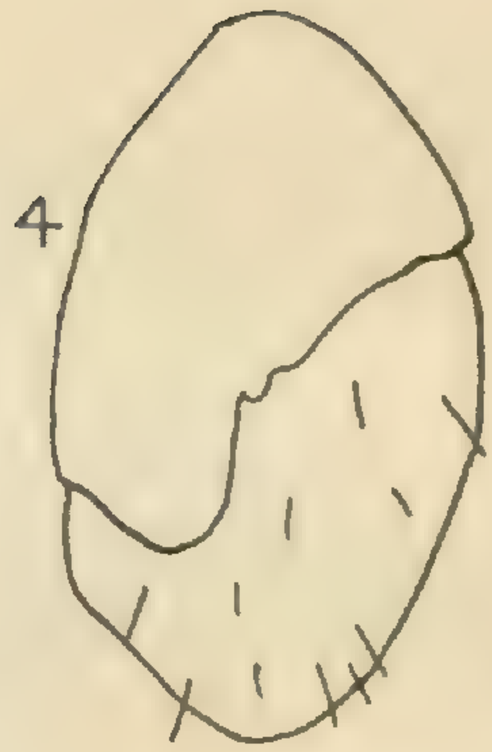

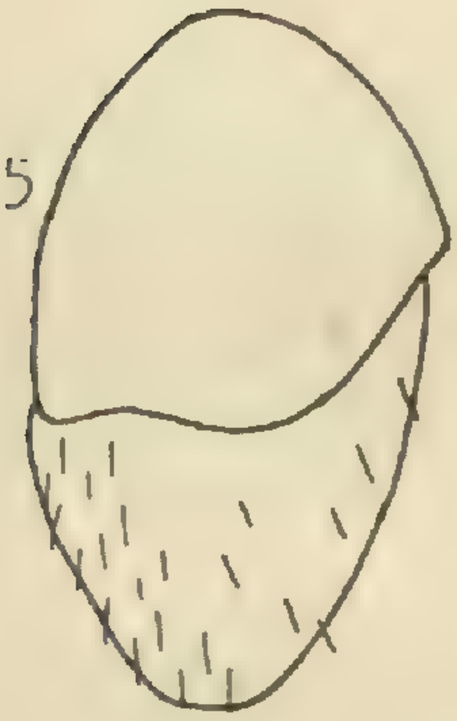

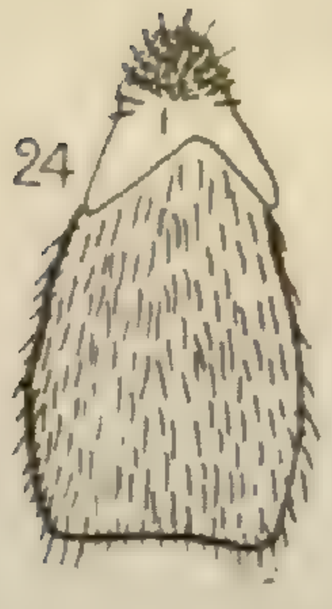

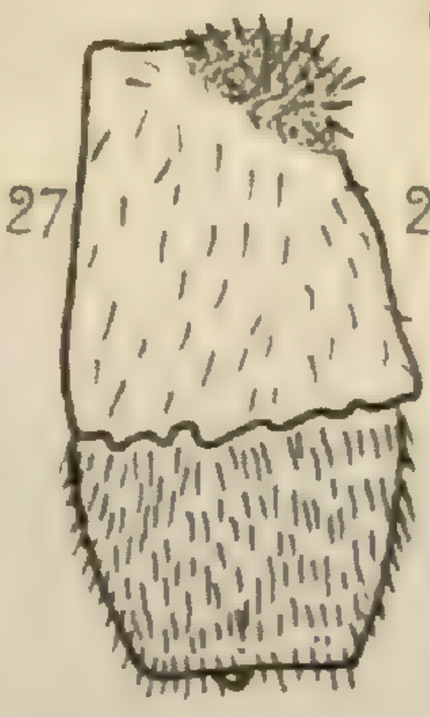

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SEEDS OF POLYGALA.

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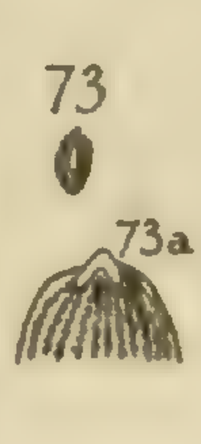
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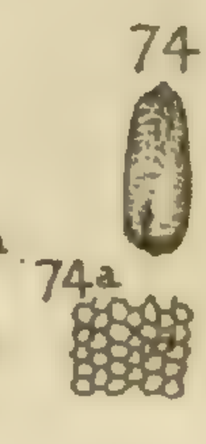
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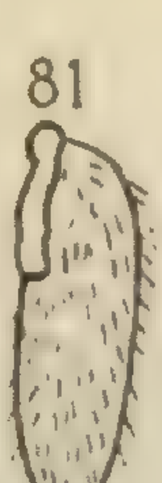
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SEEDS OF POLYGALA.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

NEW SERIES.—No. XLVIII

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II. Revision of the Genus Oreocarya
III. Notes on Certain Borraginaceae

BY J. FRANCIS MACBRIDE

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I. THE TRUE MERTENSIAS OF WESTERN NORTH AMERICA

By J. Francis Macbride.

The genus *Mertensia* reaches its greatest development in the United States west of the Great Plains or the Missouri River. No broad treatment of the genus has appeared since Dr. Gray's in the Synoptical Flora thirty years ago, although several floras have covered the species known to occur within their respective territories. These works and the number of *Mertensia* species recognized by each are as follows. Piper's Flora of Washington (Contrib. U. S. Nat. Herb. xi. 1906), 14 species; Rydberg's Flora of Colorado (Bulletin 100, Colo. Exp. Sta. 1906), 25 species; Coulter & Nelson's Man. Rocky Mt. Bot. 1909, 14 species and 10 varieties; Wooton & Standley's Flora of New Mexico (Contrib. U. S. Nat. Herb. xix. 1915), 8 species. The Synoptical Flora contains 7 species and 3 varieties, 2 species being confined to the Atlantic states. Since its publication (1886), 69 species and several varieties (without including those published here) have been proposed.

These data have been given in order to show that students are agreed in admitting in recent years a large increase to the number of species, but that they are not agreed as to what percentage of these species are valid. These great differences of opinion are due to the lack of any consensus as to what characters have specific value. The presence, absence, location or quality of pubescence, the relative lengths of corolla-limb, -tube, and calyx, the shape of the calyx-lobes and leaves have all been regarded as of equal worth. Then habit and general aspect have been considered. I have reached the conclusion that, generally speaking, the most salient and most reliable of these characters are the shape of the calyx-lobes, the location of the pubescence, and, especially when on the pedicels, its quality, coupled with aspect and habital characteristics.

The latter are of great importance, especially in the division of the genus into sections, although of course they are characteristics

that are very difficult to describe. For instance, students have long recognized that the genus, by reason of differences of aspect, falls into several natural and recognizable groups, which often appear to lack technical means of separation. A character is proposed to separate two such groups, viz.: the *Lanceolatae* and the *Oblongifoliae*, which is believed to be valid in so far as those sections are concerned, but it is of no value in separating the *Alpinae*, which happen to be well-marked, however, by their subsessile anthers. This character, the presence or absence of a ring of hairs near the base of the corolla-tube, has been used by Nelson as a specific difference. In order to determine the constancy of the character over one hundred corollas were boiled, dissected and studied critically in relation to the other characters of the particular specimens concerned.

While the present revision aims to cover the western United States a few species are omitted, notably *M. symphytoides* Greene, Pl. Baker. iii. 20 (1901) and *M. tubiflora* Rydb. Bull. Torr. Club xxvi. 544 (1899). I have seen no authentic material of these, but if I may judge from the inadequate characterization of the former, it is very near to a variety of *M. arizonica* Greene. The latter (*M. tubiflora*) seems to be related to *M. oblongifolia* (Nutt.) G. Don, and perhaps is distinct.

I am indebted to Dr. Aven Nelson, Curator of the Rocky Mountain Herbarium at the University of Wyoming, and to Mr. W. R. Maxon, Curator of the National Herbarium at Washington, D. C., for the loan of valuable specimens, including many types. The abbreviations "R. Mt. Herb." and "Nat. Herb." follow the citations of specimens from these institutions respectively; otherwise the specimens cited are in the Gray Herbarium.

Eumertensia — Key to Sections and Species of Western North America

Leaves with distinct lateral veins or net-veined, large, the middle cauline 6–12 cm. long; aestival species, 3–12 dm. high, growing along streams or in woods below timber-line or rarely above timber-line and then clearly possessing the other characters of this group ..... Group I.

Calyx-lobes acute or acuminate, usually longer than the fruit, always more or less triangular in outline, distinctly so if shorter than the fruit ..... Subsect. Paniculatae.

Calyx-lobes obtuse, shorter than, or barely as long as the fruit, oblong or linear-oblong ..... Subsect. Ciliatae.

Leaves (except sometimes the lower), without distinct lateral veins, the middle cauline rarely over 6 cm. long; vernal species, 0.5–3 (rarely 4) dm. high, of plains and foothills, or if aestival, alpine or subalpine and then possessing none of the other characters of group I. . . . . Group II.
Filaments as long as or longer than (with one exception in the *Oblongifoliae*) and as broad as or broader than the anthers; style usually longer than the corolla-tube.
Corolla-tube pubescent within, the hairs scattered over the surface or confined to a ring; species of the Great Plains and Central Rocky Mountains and southward. Subsect. LANCEOLATE.
Corolla-tube glabrous within; species essentially of the Northwest, mostly occurring north of Nevada and west of Wyoming. . . . . Subsect. OBLONGIFOLIAE.
Filaments narrower and much shorter than the anthers; style short, little exceeding the calyx. . . . . Subsect. ALPINAE.

Subsection PANICULATAE

a. Pedicels and leaves pubescent, the latter sometimes glabrous on one surface *b.*
b. Pubescence on pedicels more or less spreading and hispid in character *c.*
c. Calyx-lobes lance-linear or lanceolate in anthesis, acuminate; occurring only north of latitude 40°.
Leaves more or less pubescent on both surfaces.
Calyx-lobes in anthesis 2–3 mm. long; corolla-limb 5–8 mm. broad . . . . . 1. *M. paniculata.*
Calyx-lobes in anthesis 4–6 mm. long; corolla-limb about 10 mm. broad . . . . . 1a. var. *longisepala.*
Leaves glabrous on the upper surface. . . . . 1b. var. *subcordata.*
c. Calyx-lobes oblong-lanceolate in anthesis, merely acutish; occurring only south of latitude 40°.
Leaves pubescent on both surfaces. . . . . 2. *M. toyabensis.*
Leaves glabrous on the lower surface. . . . . 2a. var. *submuda.*
b. Pubescence on pedicels closely appressed, usually dense, tending to canescence *c.*
c. Leaves broadly ovate, the lower subcordate. . . . . 3. *M. platyphylla.*
c. Leaves lanceolate or ovate-lanceolate, never subcordate *d.*
d. Fruiting pedicels strongly reflexed; corolla less than or barely 10 mm. long. . . . . 4. *M. refracta.*
d. Fruiting pedicels ascending or nodding; corolla 10–16 mm. long *e.*
e. Calyx-lobes lanceolate, acute or acuminate; corolla 13–16 mm. long, funnelform-campanulate; leaves often pubescent beneath.
Pedicels, and at least the upper leaf-surfaces, markedly pubescent; plant of the southern Rocky Mts. . . . . 5. *M. pratensis.*
Pedicels and only upper leaf-surfaces pubescent, the hairs few and minute; plant of the northern Rocky Mts. . . . . 5a. var. *borealis.*
e. Calyx-lobes nearly oblong, acutish; corolla 10–12 mm. long, tubular-funnelform; leaves glabrous beneath. . . . . 6. *M. franciscana.*

a. Pedicels mostly glabrous; the leaves glabrous on both surfaces *b*.
b. Calyx campanulate-turbinate, the lobes much shorter than the tube and not increasing after anthesis . . 7. *M. campanulata.*
b. Calyx not campanulate, or the lobes increasing after anthesis to equal or far exceed the tube *c*.
c. Leaves sessile, except the lowest, acute or obtuse, not ovate-acuminate *d*.
d. Leaves about three times longer than broad; corolla tubular-funnelform.
Calyx-lobes in anthesis somewhat shorter than the tube . . . . . 8. *M. arizonica.*
Calyx-lobes as long as or longer than the tube, the latter sometimes nearly obsolete . . . . . 8a. var. *umbratilis.*
d. Leaves not more than twice longer than broad; corolla narrowly tubular . . . . . 9. *M. praecox.*
c. Leaves petiolate, except the upper, and ovate-acuminate.
Calyx in anthesis 4–5 mm. long, the lobes elongate. 10. *M. laevigata.*
Calyx in anthesis about 2 mm. long, the lobes short. 10a. var. *brachycalyx.*

Subsection Ciliatae

Style included in the full-grown corolla or barely exserted; calyx-lobes seldom more than 2 mm. long, the sinuses between them broad.
Leaves pubescent on the lower surface . . . . . 11. *M. subpubescens.*
Leaves glabrous on both surfaces.
Inflorescence terminal, or if in the upper axils the peduncles much shorter than the leaves . . . . . 12. *M. ciliata.*
Inflorescence terminal and axillary, the peduncles long, often exceeding the leaves . . . . . 12a. var. *longipedunculata.*
Style well exserted from the full-grown corolla; calyx-lobes 2.5–3 mm. long, their sinuses nearly or quite closed. 13. *M. stomatechoides.*

Subsection Lanceolatae

a. Tufted alpine or subalpine species with numerous basal leaves, green; calyx-tube short; calyx-lobes of soft texture, 2–5 mm. long in anthesis, the midrib not evident or at least not pronounced in fruit; midrib of cauline leaves not strongly developed (except sometimes in number 21) *b*.
b. Leaves glabrous, at least below *c*.
c. Inflorescence a leafy-bracteate panicle, the racemes open even in anthesis; calyx-lobes ovate-lanceolate.
Pubescence on pedicels and calyx-lobes sparse, not hispid-spreading . . . . . 14. *M. viridis.*
Pubescence on pedicels and calyx-lobes hispid-spreading . . . . . 14a. var. *cynoglossoides.*
c. Racemes terminal and axillary (when well peduncled), the flowers relatively crowded even in fruit; calyx-lobes linear or lanceolate *d*.
d. Leaves glabrous on both surfaces.
Hairs in corolla-tube scattered; inflorescence becoming lax in fruit . . . . . 15. *M. coronata.*

Hairs in corolla-tube confined to a ring; inflorescence congested.
Leaves mostly oblanceolate or elliptic-oblong; roots not fusiform.
Calyx-lobes lanceolate, 2–3.5 mm. long, half as long as the corolla-tube; plants 1.5–3 dm. high ..... 16. *M. coriacea.*
Calyx-lobes linear, 5 mm. long, nearly as long the corolla-tube; plants 1–1.5 dm. high. 17. *M. caelestina.*
Leaves all ovate or oval; plant from a fusiform taproot ..... 20. *M. MacDougalii.*
d. Leaves pubescent on the upper surface.
Calyx-lobes merely ciliate on the margins; roots not fusiform ..... 18. *M. ovata.*
Calyx-lobes more or less long-pubescent; plant from a fusiform tap-root ..... 21. *M. fusiformis.*
b. Leaves pubescent on both surfaces.
Leaves oblong-lanceolate to ovate-lanceolate.
Pubescence mostly appressed ..... 19. *M. Bakeri.*
Pubescence spreading ..... 19a. var. *amoena.*
Leaves linear-oblong ..... 19b. var. *lateriflora.*

a. High-plain and foothill species, not cespitosely tufted nor with numerous basal leaves, though these often present, gray-green; calyx-tube usually about equalling the lobes, the latter often only 1–2 mm. long in anthesis, the prominent midrib coriaceous in fruit; midrib of cauline leaves strongly developed *b.*
b. Calyx-lobes ovate, shorter than the calyx-tube; calyx appearing inflated in fruit; leaves pubescent, at least above.
Leaves pubescent above only ..... 22. *M. Fendleri.*
Leaves pubescent on both surfaces ..... 22a. var. *pubens.*
b. Calyx-lobes ovate-lanceolate to linear-lanceolate, as long as, or longer than the tube, or, if shorter, the leaves glabrous; calyx not inflated in fruit.
Leaves glabrous on both surfaces.
Calyx-lobes lanceolate to linear, often equalling, or longer than the tube ..... 23. *M. lanceolata.*
Calyx-lobes ovate, shorter than the tube ..... 23a. var. *brachyloba.*
Leaves pubescent on one or both surfaces.
Leaves pubescent only on the upper surface . 23b. var. *lineariloba.*
Leaves pubescent on both surfaces ..... 23c. var. *myosotifolia.*

Subsection Oblongifoliae

a. Leaves densely pubescent on both surfaces; plants large, 2–3 dm. high.
Corolla 10–12 mm. long; crests in throat glabrous; tube with 5 rigid folds ..... 24. *M. Cusickii.*
Corolla about 15 mm. long; crests long-villous; tube not plicate ..... 25. *M. eplicata.*
a. Leaves glabrous, at least on one surface; or if pubescent on both surfaces, plants small, about 1 dm. high *b.*
b. Stems 1–2 (rarely more) from shallow-seated tubers.
Leaves pubescent on the upper surface.
Corolla-tube 3 times, or at least 2 times, as long as the limb ..... 26. *M. longiflora.*

Corolla-tube less than 2 times as long as the limb. 26a. var. *Horneri*.
Leaves glabrous on both surfaces.....26b. var. *pulchella*.
b. Stems 1–many from woody fusiform or branched roots *c*.
c. Filaments fully equalling or longer than the anthers; stems less than 3 dm. high.
Stems 1–2; roots woody-fusiform; leaves oblong-lanceolate, acute; basal few or wanting...27. *M. oblongifolia*.
Stems several–many; roots branched from a branched caudex; this clothed with the remains of numerous basal leaves; leaves usually ovate-lanceolate, obtusish.
Inflorescence congested, the fruiting pedicels about 5 mm. long.
Leaves glabrous on both surfaces.....28. *M. foliosa*.
Leaves pubescent above.....28a. var. *subcalva*.
Leaves pubescent on both surfaces.....28b. var. *pubescens*.
Inflorescence open, the fruiting pedicels about 1 cm. long.....28c. var. *nevadensis*.
c. Filaments much shorter than the anthers; plants 3 dm. or more high.....29. *M. Nelsonii*.

Subsection ALPINAE

a. Inflorescence congested, even in fruit; middle-cauline leaves acute *b*.
b. Leaves glabrous, or somewhat strigillose on the upper surface.
Plants truly alpine; leaves more or less strigillose above.
Plants less than 1 dm. high, the stems ascending...30. *M. alpina*.
Plants 2–3 dm. high, the stems erect.....30a. var. *perplexa*.
Plants of the high-plains; leaves glabrous.....30b. var. *humilis*.
b. Leaves densely pubescent on both surfaces.....31. *M. canescens*.
a. Inflorescence open in fruit; middle cauline leaves rounded at apex.....32. *M. brevistyla*.

1. M. PANICULATA (Ait.) G. Don, Gen. Syst. iv. 318 (1838). *M. membranacea* Rydb. Bull. Torr. Club xxviii. 33 (1901). *Pulmonaria paniculata* Ait. Hort. Kew. i. 181 (1789). — Hudson Bay to Alberta, northern Idaho, Montana, and Michigan. — ONTARIO: Onamon River, Nipigon River, and Lake Nipigon, 1912, *H. E. Pulling;* Hudson Bay, *Burke*. MICHIGAN: south short Lake Superior, *Loring, Whitney*. SASKATCHEWAN: 1858, *E. Bourgeau*. ALBERTA: Elbow River Valley, vicinity of Calgary, July 7, 1915, *Marion E. Moodie*, no. 1053. MONTANA: Lolo Creek Canyon, Aug. 19, 1880, *Watson*. IDAHO: Cedar Mt., Latah Co., June 17, 1892, *Sandberg, MacDougal & Heller*, no. 420; Mt. Moscow, *Henderson*, no. 2813; Forks of St. Mary's River, Shoshone Co., July 1, 1895, *Leiberg*, no. 1136.

1a. var. **longisepala,** var. nov., calyce fere 5-diviso, lobis 4–6 mm. longis; corollae tubo calycem paullo superante, limbo circa 10 mm. lato. — Ontario and northern Minnesota to British Columbia and Alaska. — ONTARIO: Moose River Basin, *J. Mackintosh Bell*, 1903. MINNESOTA: Two Harbors, Lake Co., June, 1893, *E. P. Sheldon*. ALBERTA: near Banff, July 14, 1891, *Macoun;* wet wood near Boro

River, *M. A. Barber*, no. 198. British Columbia: 1865–66, *Rothrock*, no. 52. Alaska: Upper Yukon River, June, 1903, *Lt. Schuatker*; St. Michaels, June 25, 1902, *H. E. Brooks*; Anvik, 1905, *Rev. J. W. Chapman*, no. 6 (Type, Gray Herb.).

The variety is well-marked but its characters are superficial, and its range overlaps that of the typical form of the species. But I have not seen typical *M. paniculata* from Alaska. *M. strigosa* Greene, Pitt. iv. 88 (1899); *M. alaskana* Britton, Bull. N. Y. Bot. Gard. ii. 181 (1901); and *M. alaskana* Eastw. Bot. Gaz. xxxiii. 287 (1902), are all segregates, and, if I may judge from character alone, are not worthy specific rank.

1b. var. **subcordata** (Greene), comb. nov. *M. subcordata* Greene, Pitt. iv. 89 (1899). The form with glabrous calyx-lobes is *M. leptophylla* Piper, Contrib. U. S. Nat. Herb. xi. 478 (1906), and may be known as forma **leptophylla** (Piper), comb. nov. — Washington and northeastern Oregon. — Oregon: eastern Oregon, 1898, *Cusick*, no. 1911a; Union Co., 1877, *Cusick*; Wallowa Mts., July 28 & 30, 1908, *Cusick*, nos. 3292 & 3296. Washington: Blue Mts., Columbia Co., June 11, 1897, *Robt. M. Horner*, no. B.367; Mt. Stuart, July 29, 1898, *Whited*, no. 796; Olympic Mts., Sept. 27, 1890, *Piper*, no. 919.

2. **M. toyabensis,** spec. nov., robusta 4–5 dm. alta ubique subvillosa; foliis radicalibus vel infra caulis medium oblongo-lanceolatis basi in petiolum longum attenuatis 10–15 cm. longis, caulinis sessilibus lanceolatis vel ovato-lanceolatis acuminatis circa 10 cm. longis; pedunculis axillaribus a medio ad apicem caulis orientibus 6–8 cm. longis; pedicellis hirsutulis 4–8 mm. longis; calyce 5-partito, laciniis hirsutulis fere oblongis vix acutis 3–4 mm. longis post anthesin 5–6 mm. longis fructum superantibus; corollae tubo circa 6 mm. longo limbum subaequante; stylo incluso. — *M. paniculata* Gray, Syn. Fl. ii. pt. i. 201 (1886), in some part. — Nevada: Toyabe Mts., northern Nye Co., July, 1868, *Sereno Watson*, no. 843 (Type, Gray Herb.).

2a. var. **subnuda,** var. nov., foliis supra villosis vel strigosis, subtus glabris. — Utah: Fish Lake Mt., Sevier Co., July 8, 1875, *L. F. Ward* (Type, Gray Herb.).

This species combines the characters of the northern *M. paniculata* and its varieties with those of the southern *M. franciscana*, having the hirsutulous pedicels and panicled inflorescence of the former, but the calyx-lobes and leaves of the latter.

3. M. platyphylla Heller, Bull. Torr. Club xxvi. 548 (1899). *M. denticulata* Piper, Fl. N. W. Coast 301 (1915), scarcely of (Lehm.) G. Don. — In woods near the coast of Washington and probably Oregon.

The original description of this species implies that the upper leaf-surfaces are glabrous. However they are uniformly, although minutely, strigillose. Mr. Heller informs me that the plant is plentiful about Montesano, the locality of the type specimens and the only ones seen by me.

4. M. REFRACTA A. Nels. Bot. Gaz. lvi. 69 (1913). — The refracted pedicels and short corollas give this plant an aspect very different from *M. pratensis*, its nearest relative. In fact, its salient characteristic suggests *Myosotis refracta* Boiss., a species equally unique in its genus. Known to me only from the original collection from Blue Park, Colorado.

5. M. PRATENSIS Heller, Bull. Torr. Club xxvi. 550 (1899). *M. amplifolia* Wooton & Standley, Contrib. U. S. Nat. Herb. xvi. 165 (1913). *M. alba* Rydb. Bull. Torr. Club xxxi. 638 (1905) is a white-flowered form and may be known as forma **alba** (Rydb.), comb. nov. — Western Colorado and adjacent Utah, New Mexico; probably Arizona. — COLORADO: Bob Creek, West La Plata Mts., and Mt. Hesperus, June 29 & 30, 1898, *Baker, Earle, & Tracy*, nos. 234 & 252; above Cimarron and above Ouray, July 10 & Aug. 10, 1901, *C. F. Baker*, nos. 391 & 773; Tabeguache Basin, July 29, 1914, *Edwin Payson*, no. 552. UTAH: Geyser Canyon, San Juan Co., July 11, 1912, *Ernest P. Walker*, no. 256. NEW MEXICO: Santa Fe Canon, June 2, 1897, *A. A. & E. Gertrude Heller*, no. 3641; Santa Fe Creek, 1847, *Fendler*, no. 626.

5a. var. **borealis,** var. nov., fere glabescens; calycis lobis glabris. *M. paniculata* Piper, Contrib. U. S. Nat. Herb. xi. 478 (1906), not (Ait.) G. Don. — IDAHO: divide between St. Joe and Clearwater rivers, July 9, 1895, *Leiberg*, no. 1217 (TYPE, Gray Herb.; distributed as *M. siberica*). WASHINGTON: Mt. Carleton, July 16, 1902, *Kreager*, no. 190 (distributed as *M. paniculata*).

Notwithstanding the remoteness of this plant from the range of the type, its affinities with *M. pratensis* are so evident that I am constrained to treat it as only a geographical variant of the southern plant, rather than as a distinct species among the allied species of the Northwest, to none of which it is so closely related.

6. M. FRANCISCANA Heller, Bull. Torr. Club xxvi. 549 (1899). *M. grandis* Wooton & Standley, Contrib. U. S. Nat. Herb. xvi. 165 (1913). — Arizona and southwestern New Mexico. — NEW MEXICO: Mogollon Creek, Socorro Co., July 23, 1903, *Metcalfe*, no. 302. ARIZONA: Black River, & Huachuca Mts., July, 1909, *Goodding*, nos. 594, 540 & 178; Willow Spring, July 5–6, 1890, *Palmer*, no. 619; vicinity of Flagstaff, July 5, 1898, *MacDougal*, no. 232; near

Fort Huachuca, July 27, 1893, *Mearns*, no. 1547, & 1882, *Lemmon*, no. 2831.

This species is closely related to the preceding but it is confined to its own range and the differences noted in the key appear constant. The calyx-lobes approach in shape species of the *Ciliatae*, but otherwise the plant evidently belongs here.

7. M. CAMPANULATA A. Nels. Bot. Gaz. liv. 150 (1912). — In the mountains of south-central Idaho. — Hailey, Blaine Co., July, 1911, *C. N. Woods*, no. 328; moist flat near Alturus Lake, Blaine Co., July 12, 1910, *A. C. McCain* (R. Mt. Herb.). Mr. McCain reports that the species occurs in only a few places, in which localities, however, it is abundant and grows in clusters. It seems to be confined to the Sawtooth National Forest.

8. M. ARIZONICA Greene, Pitt. iii. 197 (1897). — Utah and Arizona. — UTAH: near Marysvale, July 23, 1905, *Rydberg & Carlton*, no. 7077; Pine Valley Mt., May 17, 1902, *Goodding*, no. 855 (R. Mt. Herb.); Dixie National Forest, 1914, *A. C. McCain*, no. 65 (R. Mt. Herb.). ARIZONA: 1869, *Palmer* (Nat. Herb.).

8a. var. **umbratilis** (Greenm.), comb. nov. *M. umbratilis* Greenm. Eryth. vii. 118 (1899). *M. intermedia* Rydb. Mem. N. Y. Bot. Gard. i. 335 (1900). *M. stenoloba* Greene, Pl. Baker. iii. 20 (1901). *M. Leonardi* Rydb. Bull. Torr. Club xxxvi. 680 (1909). *M. infirma* Piper, Contrib. U. S. Nat. Herb. xi. 476 (1906) *M. Sampsonii* Tidestr. Proc. Biol. Soc. Wash. xxvi. 122 (1913). — Western Montana to central Washington, eastern Oregon and Utah. — MONTANA: Bridger's Pass, 1856, *H. Engelmann*; Bozeman Pass, May 28, 1883, *F. Lamson-Scribner*, no. 176. UTAH: Red Butte, June 26, 1908, *Mrs. Joseph Clemens*; Petersen, July 19, 1902, *Pammel & Blackwood*, no. 3820; Big Cottonwood Canyon, June 29 & 30, 1905, *Rydberg & Carlton*, nos. 6442 & 6516 (R. Mt. Herb.); headwaters of Little Cottonwood Creek, above Alta, July 10, 1905, *Rydberg*, no. 6863; Logan Canyon, Cache Co., June 28, 1910, *Charles Piper Smith*, no. 2216 (R. Mt. Herb.); Provo, July 3, 1894, *Jones*, no. 5585 (R. Mt. Herb.); Mt. Nebo, June 13, 1902, *Goodding*, no. 1145 (R. Mt. Herb.). OREGON: Sparta, near Snake River, May 23, June 3, 1898, *Cusick*, no. 1886; and June, 1880, no.. 856; Crook Co., Blue Mts., June 10, 1902, *Cusick*, no. 2807. WASHINGTON: damp thickets at Ellensburg, April 25, 1897, *Whited*, no. 307 (Nat. Herb.).

The only really distinguishable feature of this variety is the more deeply cleft calyx and even this is a matter of degree. Much has been made also of the relative lengths of limb and corolla-tube but it seems to me clear that these characters are individual rather than specific or even good varietal traits, and appear to be im-

possible of correlation with geographical distribution or with other characters that are constant.

9. **M. praecox** Smiley, in herb., planta 4–5 dm. alta glabra; caulibus infirmis; foliis glaucescentibus, caulinis (radicalibus ignotis) sessilibus vel semi-amplexicaulibus ovato-ellipticis, vel superioribus suborbiculatis 6–9 cm. longis 3–4.5 cm. latis; pedunculis axillaribus 4–10 cm. longis; racemis subcorymbosis mediocriter laxis; calyce fere 5-partito, lobis glabris vel paullo ciliatis ovatis acutis 2–4 mm. longis fructum superantibus; corolla graciliter tubulosa, tubo 2.5 mm. diametro calycem triplo superante, limbo circa 5 mm. longo; stylo incluso. — UTAH: Spring Hollow, Logan Canyon, Cache Co., May 28, 1910, *Charles Piper Smith*, no. 2160 (TYPE, Gray Herb.).

The very broad rounded leaves and narrow almost exactly tubular corollas are characters that give this plant a very different aspect from *M. arizonica*, var. *umbratilis*, its closest relative. That plant is so variable, however, that *M. praecox* might be regarded as merely a broad-leaved form were it not for the fact that it seems to bloom in the same locality about a month earlier. Although the type specimens were secured May 28, they are largely in fruit, and June 28, of the same year Professor Smith secured at the same locality the variety of *M. arizonica*, just in good blossom. Other collections from the same region (see citations under *M. arizonica*, var. *umbratilis*) indicate that it blooms a month or two later than *M. praecox*. Mr. F. J. Smiley, now of the University of California, studied this plant when he was an assistant at the Gray Herbarium and he left notes outlining the chief characters of the species, which I am here publishing with his kind permission.

10. M. LAEVIGATA Piper, Contrib. U. S. Nat. Herb. xi. 477 (1906). — Cascade and Olympia Mts., Washington; probably adjacent Oregon. — WASHINGTON: Mt. Ranier, July 20, 1892, *Allen*, no. 2; Goat Mts., July 22, 1896, *Allen*, no. 231; Simcoe Mts., 1860, *Lyall*.

10a. var. **brachycalyx** (Piper), comb. nov. *M. brachycalyx* Piper, Contrib. U. S. Nat. Herb. xi. 477 (1906). — WASHINGTON: Nason Creek, Chelan Co., Aug. 4, 1893, *Sandberg & Leiberg*, no. 678. [" IDAHO," according to Rydberg, Bull. Torr. Club xl. 481 (1913).]

11. M. SUBPUBESCENS Rydb. Bull. Torr. Club xxx. 261 (1903). — Southwestern Montana and northern Wyoming. — MONTANA: West Gallatin River, June 9, 1883, *F. Lamson Scribner*, no. 175; Bozeman, June 18, 1900, *Blankinship*. WYOMING: Ten Sleep

Lakes, Big Horn Co., July 30, 1901, *Goodding*, no. 409 (distributed as *M. ciliata*).

Possibly this should be regarded as a variety of the next but the pubescent leaves suggest a relationship to some member of the *Paniculatae*. Part of the collection cited as the type was apparently mixed, as that number in this herbarium (*Rydberg & Bessey*, no. 4876) is typical *M. ciliata*.

12. M. CILIATA (James) G. Don, Gen. Syst. iv. 372 (1838). *M. polyphylla* Greene, Pitt. iv. 87 (1899); var. *polyphylla* (Greene) A. Nels. in Coulter & Nelson Man. R. Mt. 421 (1909). *M. punctata* Greene, l. c. 88; var. *punctata* (Greene) A. Nels., l. c. *M. polyphylla* Greene, var *platensis* Rydb. Bull. Torr. Club xxxi. 638 (1905). *M. picta* Rydb. l. c. *M. platensis* Rydb. l. c. xxxiii. 150 (1906). *Pulmonaria ciliata* James ex Torr. Ann. Lyc. ii. 224 (1827). —Southwestern Montana to southern Colorado, northern Utah and northern Nevada. — MONTANA: Spanish Basin, Gallatin Co., June 23, 1897, *Rydberg & Bessey*, no. 4876 in part. WYOMING: Union Pass, Aug. 13, 1894, *Aven Nelson*, no. 1098; Nash's Fork, Albany Co., July 28, 1900, *Aven Nelson*, no. 7752; Teton Mts., near Leigh's Lake, July 26, 1901, *Merrill & Wilcox*, no. 1129. COLORADO: Beaver Creek, July 7, 1896, *Crandall*, no. 1644; Mount Baldy, Dark Canon & Peak Valley, July 15 & Aug. 21, 1901, *F. E. & E. S. Clements*, nos. 288, 376, & 367; Bob Creek, West La Plata Mts., June 26, 1898, *Baker, Earle & Tracy*, no. 180; region of the Gunnison Watershed, Black Canyon & above Cimarron, June 20 & July 10, 1901, *C. F. Baker*, nos. 189 & 403; near Pagosa Peak, Aug., 1899, *C. F. Baker*, nos. 559 & 560; Uncompahgre Divide, July 27, 1914, *Edwin Payson*, no. 538. UTAH: Bear River, Aug. 1, 1902, *Pammel & Blackwood*, no. 4234; Dyer Mine, Uintah Mts., June 30, 1902, *Goodding*, no. 1200. NEVADA: near Deeth, Elko Co., July 24, 1908, *Heller*, no. 9236; Jarbidge, July 8, 1912, *Nelson & Macbride*, no. 1994.

12a. var. LONGIPEDUNCULATA A. Nels Bull. Torr. Club xxix. 402 (1902). *M. ambigua* Piper, Contrib. U. S. Nat. Herb. xi. 477 (1906). *M. denticulata* (Lehm.) G. Don, Gen. Syst. 319 (1838)? *Lithospermum denticulatum* Lehm. Asper. ii. 294 (1818)? — Yellowstone Park to Colorado, northern Nevada and central Washington. — IDAHO: Snake County, *Burke*; Silver City, Owyhee Co., July 18, 1910, *Macbride*, no. 416. WYOMING: Yellowstone Park, July 4, 1899, *A. & E. Nelson*, no. 5669; Sybille Creek, July 8, 1894, *Aven Nelson*, no. 408; Big Horn Mts., Aug. 1880, *Forwood*, no. 32; Chug Creek, Albany Co., June 30, 1900, *Aven Nelson*, no. 7321; Birds Eye, June 27 & 31, 1902, *Aven Nelson*, nos. 8695 & 8723. COLORADO: Marshal Pass, July 19, 1901, *C. F. Baker*, no. 486; summit of North Park Range, Lorimer Co., Aug. 11, 1903, *Goodding*, no. 1855;

Long's Peak, Aug. 29, 1914, *F. W. Hunnewell, 2nd.* NEVADA: East Humboldt Mts., Aug. 1868, *Watson*, no. 842. WASHINGTON: Cascade Mts., 1889, *Vasey*, no. 402 (Nat. Herb.).

This somewhat variable species is the most common *Mertensia* of the intermountain region. Dr. Gray, in the Syn. Fl. ii. pt. 1, 200 (1886), referred it to *M. siberica* (L.) G. Don, but the identity of that species is very obscure. Then there are other nearly related species, the identity of which must be established before it will be possible to state, with any degree of certainty, the relationship of our Mertensias to those of Siberia. Although the Siberian material which I have been able to examine has been very meager it has not suggested that our species will utimately prove identical with the Asiatic. Accordingly I have followed nearly all recent American botanists in excluding *M. siberica* from the United States.

The disposition of *M. denticulata* (Lehm.) G. Don is equally perplexing. Piper, Contrib. U. S. Nat. Herb. xi. 478 (1906), referred it doubtfully to *M. platyphylla* Heller and called attention to the fact that, according to Hooker, the type came from " shady woods near the confluence of the Columbia with the sea." More recently in Piper & Beattie's Fl. N. W. Coast, 301 (1915) the name *M. denticulata* is taken up for Heller's species. It is true, if Hooker was not mistaken, that the type locality is almost the same as that of *M. platyphylla* Heller, but if Lehmann's characterization is correct, the names must apply to different plants. For instance, " foliis subglabris . . . radicalibus ovatis, caulinis oblongis," and " calyx brevissimus, . . . laciniis oblongis " (l. c.), are characters that do not accord with the distinctly pubescent broadly subcordate basal, and broadly ovate cauline leaves and the long, linear-lanceolate cayx-lobes of *M. platyphylla*. On the contrary, if one may judge from the original description, it seems very probable that Dr. Gray was justified in considering *M. denticulata* the same as *M. ciliata* (i. e. *M. siberica* of the Syn. Fl., l. c.). The inflorescence (ex char.), however, is that of the variety *longipedunculata*, so that, on the adopton of the name *M. denticulata*, the species *ciliata* (in accord with my treatment) would become the variety. But there is still the possibility that *M. siberica* will be shown to be the same, and in that case, since it is an earlier name, it would supplant *M. denticulata*. Accordingly it has not seemed advisable to substitute at this time either *M. denticulata* or *M. siberica* for the well-known

M. ciliata, the precise application of the former two being so seriously open to question.

13. M. STOMATECHOIDES Kellogg, Proc. Cal. Acad. ii. 148 (1862). *M. siberica* Gray, Syn. Fl. ii. pt. i. 200 (1886), in part, not (L.) G. Don. — In the mountains, western Nevada to southern California. — NEVADA: Marlette Lake, Washoe Co., July 10, 1902, *C. F. Baker*, no. 1302; Snow Valley, Ormsby Co., June 24, 1902, *C. F. Baker*, no. 1154. CALIFORNIA: Sierra Co., & Sierra Valley, 1874 & 1873, *Lemmon*; southern Sierras, 186–, *Bolander*, no. 2487; Hockett's Meadow, Tulare Co., July 16, 1904, *Culbertson*, no. 4375.

14. M. VIRIDIS A. Nels. Bull. Torr. Club xxvi. 244 (1899). *M. viridula* Rydb. Bull. Torr. Club xxxi. 639 (1905). — Southern Wyoming and Colorado. — WYOMING: Laramie Peak, Albany Co., July 12, 1900 & Aug. 6, 1895, *Aven Nelson*, nos. 7549 & 1608. COLORADO: Jack Brook, June 25, 1901, *F. E. & E. S. Clements*, no. 232 (distributed as *M. pratensis*).

14a. var. **cynoglossoides** (Greene), comb. nov. *M. cynoglossoides* Greene, Pl. Baker. iii. 19 (1901); *M. muriculata* Greene, l. c. — West central Colorado.—Black Canyon, June 20, 1901, *C. F. Baker*, nos. 191 & 193.

15. M. CORONATA A. Nels. Bull. Torr. Club xxix. 403 (1902). — Apparently restricted to the Leucite Hills formation, southwestern Wyoming. — Leucite Hills, Sweetwater Co., June 9, 1900, *Aven Nelson*, no. 7071; Leucite Hills, June 17, 1901, *Merrill & Wilcox*, no. 698 (distributed as *M. lanceolata*).

16. M. CORIACEA A. Nels. Bull. Torr. Club xxxix. 402 (1902); Coulter & Nelson Man. R. Mt. 420 (1909), as to description. *M. coriacea* A. Nels., var. *dilatata* A. Nels. l. c. 403. — Alpine; Medicine Bow Mts., southeastern Wyoming to Grand Co., Colorado. — WYOMING: Medicine Bow Mts., Aug. 1, 1900 & Aug. 15, 1908, *Aven Nelson*, nos. 7844, 7870 & 9149. COLORADO: Summit of North Park Range, Larimer Co., Aug. 10, 1903, *Goodding*, no. 1827.

Dr. Rydberg has expressed the opinion, Bull. Torr. Club xl. 481 (1913), that this plant is the same as *M. lanceolata* (Pursh) DC.

17. M. CAELESTINA Nels. & Ckll. Proc. Biol. Soc. Wash. xvi. 46 (1903); Wooton & Standley, Contrib. U. S. Nat. Herb. xix. 541 (1915). — Alpine; northern New Mexico. — Truchas Peaks, above timber line, 1902, *Mrs. W. P. Cockerell*, no. 40 (R. Mt. Herb.).

18. M. OVATA Rydb. Bull. Torr. Club xxviii. 32 (1901); Coulter & Nelson Man. R. Mt. 421 (1909). *M. Parryi* Rydb. l. c. xxxi. 639 (1905); as synonym, Coulter & Nelson, l. c. — On the higher mountains of Colorado. — West Spanish Peak, July 6, 1900, *Rydberg & Vreeland*, no. 5690 (R. Mt. Herb.); Estes Park, July 22, 1903, *Osterhout*, no. 2848 (R. Mt. Herb.); Beaver Creek, July 19, 1898, *Rydberg* (?), no. 4189 (R. Mt. Herb.); Sierra Blanca, 1877,

Hooker & Gray; Anita Peak, Routt Co., Aug. 3, 1903, *Goodding;* alpine ridges lying east of Middle Park, 1861, *Parry*, no. 283 (type of *M. Parryi* Rydb. l. c. and cited wrongly as no. "286").

19. M. BAKERI Greene, Pitt. iv. 90 (1899). *M. nivalis* (Wats.) Rydb. Mem. N. Y. Bot. Gard. i. 336 (1900), as to name, not as to plants cited; *M. paniculata* (Ait.) G. Don, var. *nivalis* Wats. Bot. King's Expl. v. 239 (1871). — Colorado and northwestern Utah. — COLORADO: Hayden Peak, July 14, 1898, *Baker, Earle & Tracy*, no. 576; Carson, July 2, & Marshall Pass, July 19, 1901, *C. F. Baker*, nos. 293 & 497; Spicer, Larimer Co., July 10, 1903, *Goodding*, no. 1519. UTAH: Fish Lake, Uintah Mts., July 17, 1902, *Goodding*, no. 1386; Bear River Canyon, Aug. 1869, *Watson*, no. 844.

19a. var. AMOENA A. Nels. in Coulter & Nelson Man. R. Mt. 422 (1909). *M. amoena* A. Nels. Bot. Gaz. xxx. 195 (1900). — Yellowstone Park and adjacent regions to northern New Mexico. — MONTANA: Monida, Madison Co., June 16, 1899, *A. & E. Nelson*, no. 5413. COLORADO: Sulphur Springs, Grand Co., June 8, 1906, *Osterhout*, no. 3225.

19b. var. LATIFLORA (Greene) A. Nels. in Coulter & Nelson Man. R. Mt. 423 (1909), excluding synonym. *M. lateriflora* Greene, Pl. Baker. iii. 18 (1901). — COLORADO: Carson, July 21, 1901, *C. F. Baker*, no. 334; Palsgrove Canyon, June 27, 1901, *F. E. & E. S. Clements*, no. 324; ex regione media Montium Scopulosorum, July, 1884, *John Ball*; Veta Pass, *G. H. Hicks.*

20. M. MACDOUGALII Heller, Bull. Torr. Club xxvi. 550 (1899). — ARIZONA: about Mormon Lake, June 12, 1898, *MacDougal*, no. 95. — This is the only collection I have seen and our specimen, unfortunately, is in full fruit.

21. M. FUSIFORMIS Greene, Pitt. iv. 89 (1899). *M. congesta* Greene, Pl. Baker, iii. 17 (1901). *M. papillosa* Greene, var. *fusiformis* (Greene) A. Nels. in Coulter & Nelson Man. R. Mt. 421 (1909). — Southwestern Colorado to northeastern Utah. — COLORADO: Bob Creek, West LaPlata Mts., June 28, 1898, *Baker, Earle & Tracy*, no. 206; Poverty Ridge, above Cimarron, June 13, 1901, *C. F. Baker*, no. 129; Graham's Park, May, 1899, *C. F. Baker*, no. 558; Tebeguache Basin, June 3, 1914, *Edwin Payson*, no. 376. UTAH: Dyer Mine, Uintah Mts., June 30, 1902, *Goodding*, no. 1222.

22. M. FENDLERI Gray, Am. Journ. Sci. II. xxxiv. 339 (1862). *M. lanceolata* (Pursh) DC., var. *Fendleri* Gray, Proc. Am. Acad. x. 53 (1874). — NORTHERN NEW MEXICO: Santa Fe Canyon, June 2, 1897, *A. A. & E. Gertrude Heller*, no. 3640; Santa Fe Creek, 1847, *Fendler*, no. 625; *Palmer* (no locality).

22a. var. **pubens,** var. nov., foliis utrinque dense pubescentibus. — NEW MEXICO: Winsor's Ranch, San Miguel Co., June 29, 1908, *Standley*, no. 4023 (TYPE, Gray Herb.); 5 miles above Mora, San Miguel Co., May 30–June 1, 1902, *W. C. Sturgis.*

23. M. LANCEOLATA (Pursh) DC. ex A. DC. Prod. x. 88 (1846). *M. papillosa* Greene, Pitt. iii. 261 (1898). *Pulmonaria lanceolata* Pursh, Fl. Am. Bor. ii. 729 (1814). *M. lanceolata* Gray, Syn. Fl. ii. 201 (1886), as to most glabrous specimens. — Plains and foothills; southern Saskatchewan to central Colorado. — SASKATCHEWAN: Wood Mt., June 6, 1895, *John Macoun*, no. 11,838. NORTH DAKOTA: Portal, June 13, 1913, *M. A. Barber*, no. 333. SOUTH DAKOTA: Newell, May 12, 1913, *W. P. Carr*, no. 11. WYOMING: Stinking Water, 1873, *Parry*, no. 226. COLORADO: Sulphur Springs, Grand Co., June 10, 1906, *Osterhout*, no. 3249; Douglas Co., May, 1890, *Mrs. S. B. Walker* (in herb. of Walter Deane).

23a. var. BRACHYLOBA (Greene) A. Nels. in Coulter & Nelson Man. R. Mt. 422 (1909). *M. brachyloba* Greene, Pitt. iv. 90 (1899). — Central and northern COLORADO. — Estes Park, Larimer Co., July 6–9, 1913, *F. W. Hunnewell, 2nd.*, no. 2414 (in herb. of collector).

23b. var. **lineariloba** (Rydb.), comb. nov. *M. linearis* Greene, Pitt. iii. 197 (1897). *M. lineariloba* Rydb. Bull. Torr. Club xxviii. 32 (1901). *M. papillosa* Greene, var. *lineariloba* (Rydb.) A. Nels. in Coulter & Nelson Man. R. Mt. 421 (1909). *M. lanceolata* A. Nels. in Coulter & Nelson Man. R. Mt. 422 (1909); Gray, Syn. Fl. ii. pt. i. 201 (1886), in part. — SOUTH DAKOTA: Willow Creek, near Custer, May 16, 1908, *John Murdock, Jr.*, no. 3023. WYOMING: Chug Creek, Albany Co., June 30, 1900, *Aven Nelson*, no. 7332; Laramie Hills, May 16, 1894, *Aven Nelson*, no. 34. COLORADO: Hills, southeast of LaVeta, May 18, 1900, *Rydberg & Vreeland*, no. 5695 (R. Mt. Herb.); Colorado Springs, May 14, 1903, *W. C. Sturgis*; "Ex regione media Montium Scopulosorum," July, 1884, *John Ball;* Rocky Mts., 1862, *Hall & Harbour*, no. 445.

23c. var. **myosotifolia** (Heller), comb. nov. *M. myosotifolia* Heller, ex Rydb. Fl. Colo. 290, 292 (1905). *M. secundorum* Ckll. Muhlenbergia iii. 68 (1907). *M. micrantha* A. Nels. Proc. Biol. Soc. Wash. xx. 37 (1907). *M. lanceolata* Gray, Syn. Fl. ii. pt. 1. 201 (1886), as to pubescent specimens. — Central and northern COLORADO. — Golden, etc., 1871, *Greene;* Cross Ruxton, June 16, 1901, *F. E. & E. S. Clements*; dry places in Clear Creek Canyon, Georgetown, July 8 & 27, 1885 (leaves and flowers small), & damp, shaded places near Empire, July 10, 1885 (leaves and flowers large), *H. N. Patterson*, no. 115; Boulder, May 18, 1909, *Cockerell*, no. 6256 (R. Mt. Herb.; Univ. of Colo. Herb.); Sugar Loaf Mt., July 14, 1906, *Rameley & Robbins*, no. 1750 (R. Mt. Herb.); Moraine Park, Larimer Co., July 20, 1903, *Osterhout*, no. 2824 (R. Mt. Herb.); Rocky Mts., 1862, *Hall & Harbour*, no. 134; Douglas Co., May, 1890, *Mrs. S. B. Walker* (part of collection cited under the typical form of the species).

Perhaps this is the most troublesome group in the genus. The plants vary greatly in amount of pubescence, size and shape of

leaves, and size of corollas; while the appendages in the corolla-throat vary from glabrous to more or less densely long-pubescent. The specimens examined all come from adjoining counties in central Colorado and it has seemed impossible to correlate any of these characters, or to find other concomitant characters. Therefore I have come to the conclusion that these apparent differences are superficial and possess here no taxonomic value. For instance, the collection from Douglas Co., by *Mrs. S. B. Walker* (cited both under the species and the var. *myosotifolia*), consists of two plants mounted on one sheet, one of which is glabrous, the other pubescent, but otherwise they are as similar as the proverbial peas; and I suspect that the " species " and the " variety " grew on the same hillside. Dr. Cockerell, of the University of Colorado, has an interesting and plausible theory in regard to this. He writes me, " My present view is that *M. secundorum* is *M. lanceolata* plus hairs — they very probably are Mendelian opposites and essentially one species." [1]

24. M. Cusickii Piper, Bull. Torr. Club xxix. 643 (1902). — Southeastern Oregon. — Stein's Mts., June 18, 1901, *Cusick*, no. 2582; Owyhee, Malheur Divide, May 31, 1896, *Leiberg*, no. 2178.

25. **M. eplicata,** spec. nov., erecta 2–3 dm. alta; radice crassa fusiformi sublignosa; caulibus pubescentibus; foliis utrinque subvillosis, radicalibus 1.5–2.5 dm. longis, laminis ovatis obtusis basi cuneatis 6–12 cm. longis 2.5–4.5 cm. latis, petiolis 6–12 cm. longis; foliis caulinis oblongis vel oblongo-lanceolatis basi attenuatis apice obtusis; floribus terminalibus congestis, junioribus nutantibus; calyce villoso, lobis lanceolatis acutis 4–5 mm. longis; corolla fere tubulosa, tubo intus glabro sine plicaturis circa 10 mm. longo 3–3.5 mm. diametro, limbo 4–5 mm. lato circa 5 mm. longo; corollae appendiculis villosis; staminibus et stylo vix inclusis. — Idaho: in clumps, moist open slopes, Dry Buck, Boise Co., May 10, 1911, *Macbride*, no. 856 (Type, R. Mt. Herb., Cotype, Gray Herb.).

This species was distributed as *M. Cusickii* Piper. Then Dr. Rydberg expressed the opinion (in a letter) that he would refer it to *M. amoena* A. Nels. (*M. Bakeri* Greene, var. *amoena* A. Nels.). After a careful examination of the corolla I cannot agree with this

[1] As the present paper was going to press Professor T. D. A. Cockerell kindly informed me of a striking variation which he proposes as M. lanceolata (Pursh) DC., var. **aperta** Ckll., var. nov., corolla multo apertiore circa 10 mm. diametro, tubo brevissimo; calycis lobis tubum corollae aequantibus. — Boulder, Colorado, April 27, 1916, *Viola Philipps* (Type, Univ. of Colo.; Cotype, Gray Herb.). It seems entirely possible that this is only a teratological form.

view. The tube is glabrous, a fact that places the plant in the *Oblongifoliae*. Even if we disregard this important character, the fusiform tap-root, large basal leaves and tubular corolla are features at variance with *M. Bakeri* or other *Lanceolatae*. It is true the root resembles that of *M. fusiformis*, but the other characters are different. *M. Cusickii* is its nearest relative, and the resemblance is so great that it is not surprising that the species masqueraded under that name. However, the corolla of *M. Cusickii* is smaller, the appendages in the throat are glabrons, the tube has five longitudinal rigid folds within, and the stamens reach only to the base of the corolla-lobes. Dr. Rydberg considers some large specimens from Beaver Canyon, Idaho, as belonging here, but those that I have from there are, on the other hand, somewhat luxuriant examples of *M. Bakeri*, var. *amoena*.

26. M. LONGIFLORA Greene, Pitt. iii. 261 (1897). *M. oblongifolia* Gray, Syn. Fl. ii. pt. i. 200 (1886), in part; Piper, Contrib. U. S. Nat. Herb. xi. 479 (1906); Howell, Fl. N. W. Am. 491 (1901); Rydb. Mem. N. Y. Bot. Gard. i. 336 (1900), not (Nutt.) G. Don. — Western Montana to Washington and eastern Oregon. — MONTANA: Columbia Falls, May 22, 1893, *R. S. Williams*, no. 977. OREGON: Blue Mts., May 21, 1885, *Thomas Howell*, no. 526; *Geyer*, no. 316. WASHINGTON: Hangman Creek, Spokane Co., May 20, 1893, *Sandberg & Leiberg*, no. 48; Cheney, 1890, *Mrs. Susan Tucker*.

26a. var. **Horneri** (Piper), comb. nov. *M. Horneri* Piper, Contrib. U. S. Nat. Herb. xi. 479 (1906). — Eastern Oregon to southeastern Washington. — OREGON: stony hillsides, eastern Oregon, April 13, 1898, *Cusick*, no. 1830; basaltic soil, moist open hills, April 12, 1907, *Cusick*, no. 3151. WASHINGTON: Waitsburg, April 3, 1897, *Robt. M. Horner*, no. R 155, B 366.

Very near the species and possibly not even varietally distinct.

26b. var. **pulchella** (Piper), comb. nov. *M. pulchella* Piper, Contrib. U. S. Nat. Herb. xi. 478 (1906); *M. pulchella* Piper, subsp. *glauca* Piper, l. c. 479. — Southern British Columbia to eastern Oregon. — IDAHO: valley of Clearwater River, Nez Perces Co., April 28, 1892, *Sandberg, MacDougal & Heller*, no. 75. OREGON: Wallowa Mts., May 1, 6, & June 8, *Cusick*, nos. 3159, 3155, & 3169; Umatilla River, Blue Mts., April 7, 1910, *Cusick*, no. 3424. WASHINGTON: hills west of Wenatchee, March 31, 1899, *Whited*, no. 1010 ? BRITISH COLUMBIA: Trail, May 26, 1902, *J. M. Macoun*, no. 66,567.

27. M. OBLONGIFOLIA (Nutt.) G. Don, Gen. Syst. iv. 372 (1838). *Pulmonaria oblongifolia* Nutt. Journ. Acad. Phil. vii. 43 (1834), not

of recent botanists; see *M. longiflora* Greene. — Western Montana to British Columbia. — MONTANA: *W. J. Howard* (no locality); foothills, Bozeman, May 23, 1899 & May 11, 1900, *Blankinship*; Sedan, Gallatin Co., May 5, 1901, *B. J. Jones.*

This species has been long misinterpreted. The original description (l. c.) calls for " foliis lanceolato-oblongis obtusiusculis, superioribus acutis . . . calycibus abbreviatis, laciniis linearibus acutis ciliatis." And again in a footnote, " the segments of the calyx narrow-linear and very acute." Some scraps of a specimen in this herbarium are labeled in Dr. Gray's hand " *M. oblongifolia* Nutt.! ex. sp. Wyeth! misit Durand 1861." Evidently these are a part of the type, and they accord with Nuttalls's description perfectly; additional characters may be noted as follows: pedicels very sparsely hispid; calyx cleft nearly to the base, the divisions 5 mm. long, when moistened, linear-lanceolate; corolla-tube glabrous within, 10 mm. long, limb 5 mm. long; filaments as broad and as long as the anthers which the style slightly exceeds. The specimens cited essentially agree with this type material.

28. M. FOLIOSA A. Nels. Bull. Torr. Club xxvi. 243 (1899). *M. nutans* Howell, Fl. N. W. Am. 491 (1901); *M. oblongifolia* Gray, Syn. Fl. ii. pt. i. 200 (1886), in small part. — Southern Montana and adjacent Wyoming to central Washington, south to Nevada, northern Utah and southwestern Wyoming. — MONTANA: Bridger Mts., Gallatin Co., June 15, 1897, *Rydberg & Bessey*, no. 4870 (distributed as *M. lanceolata*). IDAHO: Silver City, Owyhee Co., June 20, 1911, *Macbride*, no. 942. WYOMING: Hurlburt Creek, Sheridan Co., May 4, 1909, *Vie Willits*, no. 6 (R. Mt. Herb.); Cumberland & Kemmerer, Uinta Co., May 31 & June 1, 1907, *Aven Nelson*, nos. 9007 & 9016; Evanston, Uinta Co., May 28, 1897, *Aven Nelson*, no. 2951. UTAH: Red Butte, near Salt Lake, April 24 & 27, 1908, *Mrs. Joseph Clemens*, & April 22, 1905, *A. O. Garrett*, no. 1074. NEVADA: Trinity Mts., May, 1865, *Watson*, no. 840; Jarbidge, Elko Co., July 6, 1912, *Nelson & Macbride*, no. 1938, in part (distributed as *M. coronata*). OREGON: Castle Rock Mts. June 10, 1897, *Cusick*, no. 1629; Owyhee, Malheur Divide, May 30, 1896, *Leiberg*, no. 2166; Juniper Mt., Malheur Co., May 7, 1900, *Cusick*, no. 2376. WASHINGTON: Dutch John's, near Wenatchee, April 23, 1899, *Whited*, no. 1034, in part (Nat. Herb.).

28a. var. **subcalva** (Piper), comb. nov. *M. nutans* Howell, subsp. *subcalva* Piper, Contrib. U. S. Nat. Herb. xi. 479 (1906). — Southwestern Montana to Washington, south to Nevada. — MONTANA: Spanish Creek, Gallatin Co., May 12, 1901, *J. Vogel.* NEVADA: Jarbidge, July 6, 1912, *Nelson & Macbride*, no. 1938, in part; East

Humboldt Mts., July, 1865, *Watson*, no. 841. WASHINGTON: Dutch John's, near Wenatchee, April 23, 1899, *Whited*. no. 1034, in part; Rattlesnake Mts., April 29, 1901, *J. S. Cotton*, no. 328.

28b. var. **pubescens** (Piper), comb. nov. *M. pubescens* Piper, Contrib. U. S. Nat. Herb. xi. 479 (1906). — WASHINGTON: Waterville, Douglas Co., April 23, 1900, *Whited*, no. 1214 (Nat. Herb.).

28c. var. **nevadensis** (A. Nels.), comb. nov. *M. nevadensis* A. Nels. Proc. Biol. Soc. Wash. xvii. 96 (1904). — NEVADA: Hunter Creek Canyon, near Reno, May 16, 1903, *P. B. Kennedy & G. H. True*, no. 711 (R. Mt. Herb.); Ruby Mts. July 8, 1912, *Heller*, nos. 10541 & 10546; Clover Mt. Range near Deeth, July 24, 1908, *Heller*, no. 9181 (not typical). The specimens by Mr. Heller distributed as *M. lanceolata*.

The varieties merge with the species and with each other. The variety *nevadensis* is typically well-marked by its open inflorescence but the individual plants vary from glabrous to pubescent as in the variety *subcalva*.

29. **M. Nelsonii,** spec. nov., usque ad 3–4 dm. alta; radicibus numerosis lignescentibus et fibroso-ramosis; caulibus adscendentibus vel suberectis plus minusve flexuosis basi ad apicem fere aequabiliter foliosissimis; foliis viridibus glabris vel interdum supra paullo pubescentibus, caulinis elliptico-lanceolatis sessilibus et basi cuneatis vel in petiolum attenuatis, apice obtusis, usque ad 8 cm. longis 2 cm. latis; superioribus ovato-ellipticis subacutis; pedunculis axillaribus circa 6 cm. longis; floribus subfasciculatis mediocriter congestis; pedicellis fructiferis 5–8 mm. longis; calyce fere 5-partito, laciniis ovatis acutis paullo ciliatis, 2–3 mm. longis; corollae tubo intus glabro 6 mm. longo, limbo 4 mm. longo; stylo circa 10 mm. longo; filamentis quam antherae multo brevioribus. — NEVADA: Jarbidge, Elko Co., July 9, 1912, *Nelson & Macbride*, no. 1995 (TYPE, R. Mt. Herb.).

This species bears a superficial resemblance to *M. viridis* A. Nels. of the *Lanceolatae*, but that plant, in common with the other members of its section, has the corolla-tube pubescent within, the filaments as long as or longer than the anthers, and a very different root system. The very short filaments suggest a relationship to the *Alpinae*, but the long style, habit and aspect of the plant place it in the *Oblongifoliae*. It is to be regarded, perhaps, as a connecting link between these two sections.

30. M. ALPINA (Torr.) G. Don, Gen. Syst. iv. 372 (1838). *M. Tweedyi* Rydb. Mem. N. Y. Bot. Gard. i. 336 (1901). *M. obtusiloba* Rydb. Bull. Torr. Club xxviii. 32 (1901). *M. brevistyla* Wats., var. *obtusiloba* (Rydb.) A. Nels. in Coulter & Nelson Man. R. Mt.

421 (1909). *Pulmonaria alpina* Torr. Ann. Lyc. ii. 224 (1827). — Montana, Wyoming, Colorado. — MONTANA: near Pony, July 7 & 9, 1897, *Rydberg & Bessey*, no. 4867; Spanish Peaks, July 10, 1901, *J. Vogel*. WYOMING: Yellowstone Park, July 13, 1899, *A. & E. Nelson*, no. 5811; Dune Lake, July 18, 1896, *Aven Nelson*, no. 2434. COLORADO: Saddle Cliffs, July 6, 1901, *A. E. & E. S. Clements*, no. 405; Pike's Peak, Aug. 27, 1895, *Canby*.

30a. var. **perplexa** (Rydb.), comb. nov. *M. perplexa* Rydb. Bull. Torr. Club xxxi. 639 (1905); *M. alpina* Gray, Syn. Fl. ii. pt. 1, 201 (1886), in part. — COLORADO: 1868, *Vasey*, no. 437; Gray's Peak & vicinity, July & August, 1885, *H. N. Patterson*, nos. 113 & 114, in part; 1872, *Gray*.

30b. var. **humilis** (Rydb.), comb. nov. *M. humilis* Rydb. Bull. Torr. Club xxxvi. 681 (1909). *M. alpina* A. Nels. in Coulter & Nelson Man. R. Mt., as to description and glabrous specimens; Gray, Syn. Fl. l. c. in part. — High Plains; southern Wyoming and Colorado. — WYOMING: Laramie Hills & Sand Creek, Albany Co., May 16, 1894 & June 2, 1900, *Aven Nelson*, nos. 33 & 7043. COLORADO: headwaters of Clear Creek, 1861, *Parry*, no. 287.

31. M. CANESCENS Rydb. Bull. Torr. Club xxxi. 640 (1905). *M. cana* Rydb. Bull. Torr. Club. xxxvi. 698 (1909). — COLORADO: Berthoud Pass, Grand Co., July, 1903, *Tweedy*, no. 5664 (R. Mt. Herb.); Gray's Peak & Vicinity, July & Aug., 1885, *H. N. Patterson*, no. 114, in part.

32. M. BREVISTYLA Wats. Bot. King's Expl. 239 (1871). *M. alpina* (Torr.) G. Don, var. *brevistyla* (Wats.) Jones, Contrib. W. Bot. xii. 56 (1908). *M. alpina* Gray, Syn. Fl. l. c. in part. — UTAH: Emigration Canyon, Salt Lake Co., June 14, 1913, *Garrett*, no. 2716; Wasatch Mts., May, 1869, *Watson*, no. 485; Red Butte Canyon, Salt Lake Co., April 22, 1905, *Garrett*, no. 1075; Red Butte & Parley's Canyons, May 8, 1909, & May 29, 1908, *Mrs. Joseph Clemens*.

Rydberg includes this species in his Flora of Colorado and Nelson in the Coulter & Nelson Manual gives the range as "western central Rocky Mountains." However the specimens I have seen have all come from Utah.

II. REVISION OF THE GENUS OREOCARYA

This group of plants has never been revised as a genus. When Dr. Gray treated it as a section under *Krynitzkia*, Proc. Am. Acad. xx. 277 et seq. (1885), he recognized seven species and at that time but few more had been proposed. Then in 1896 Dr. Greene (Pitt. iii. 109–115) added seven species to his genus *Oreocarya*, Pitt. i. 57 (1887), and discussed the status of some of the older species. The

next work of importance in this connection was by Dr. Rydberg in his Flora of Colorado, Bull. 100, Colo. Agric. Exp. Sta., 286 (1906), where he keyed out nineteen species. Miss Alice Eastwood, in a paper devoted to this genus, Bull. Torr. Club. xxx. 238–246 (1903), contributed largely to this increase in the number of recognized species. Finally the treatment by Professor Aven Nelson in the Coulter-Nelson Man. R. Mt. Bot. 416–419 (1909) gave a key and also descriptions with citations, recognizing nineteen species for the central Rocky Mountain region. Since the genus reaches its greatest development in Colorado I am most indebted to these works, but floras covering the outskirts of the range of the genus have been helpful for their regions, notably Wooton & Standley in Contrib. U. S. Nat. Herb. xix. 544–546 (1915) and Piper, Contrib. U. S. Nat. Herb. xi. 481–482 (1906). When one considers that sixty species have been credited to this genus although only nineteen have appeared in any one work, the need of a general revision is apparent. It is of interest that this remarkable increase from seven species in 1885 to sixty in 1916 has been largely warranted, having been due at least in great part, to the discovery that the species possess excellent characters of fruit, which may serve to distinguish them when other characters are not apparent. In this respect *Oreocarya* resembles greatly *Cryptantha*. Other characters that are important are the shape of the calyx-divisions, nature of the pubescence and the inflorescence. Habit, size of corolla and duration are often to be considered. The color of the corolla is constantly white, yellow, or white and yellow. Compared with *Mertensia* the genus furnishes some striking contrasts. For instance, the characters are usually perfectly definite and the species rarely exhibit perplexing variations. This may be illustrated concretely by the fact that, although forty-five species of *Oreocarya* are recognized only three have been noted as varieties while in *Mertensia*, the recognition of thirty-two species has disclosed nineteen variations that seemed to be worthy a name. The genus, therefore, is not difficult provided the specimens are in fruit. But it is impossible in many cases to determine accurately specimens that are only in flower. Collectors, therefore, should use the same effort and care to secure mature plants as in the genus *Cryptantha*.

A very promising and interesting field for investigation, in this group especially, is a study of the degree to which certain species

are restricted to certain soils. Such a study would proably explain the peculiarly local character of many species and the widely interrupted ranges of others. The genus is admirably suited to this kind of study as species are known from many types of soils, as limestone, granite, shales, etc., and in many cases the range of the species would doubtless be found to be correlated with the occurrence of certain formations.

I have seen at least one specimen of nearly every species included. *O. interrupta* Greene, Pitt. iii. 111 (1896), and *O. urticacea* Woot. & Standl. Contrib. U. S. Nat. Herb. xvi. 166 (1913) I have not seen. The former is very poorly described. It may be related to *O. nitida* but is of enormous size (" 1 1/2–3 feet high "). It is said to abound in woods east of Wells, Nevada. The latter may be a good species related to *O. glomerata* and confined to New Mexico. *Kryniztkia fulvocanescens* Gray, var. *idahoensis* Jones. Contrib. W. Bot. xiii. 6 (1910) and *K. multicaulis* Torr., var. *setosa* Jones, l. c. 4, I have not been able to place. Mr. Jones stands practically alone in not recognizing the genus *Oreocarya*. This, of course, is a matter of personal opinion but it is not clear on what grounds he persists in using *Krynitzkia* to the displacement of the earlier and valid *Cryptantha*. Such action does not accord with his work in other groups.

All specimens cited are in the Gray Herbarium except when the citation is followed by the abbreviation " R. Mt. Herb.," in which case I am indebted to Professor Nelson for the loan of Rocky Mountain Herbarium material.

Key to the Species and Varieties

a. Nutlets bordered by a conspicuous wing; robust plants 5–10 dm. high with long ebracteate spikes; corolla small, white, the tube included in the calyx, the latter enlarged and ovoid in fruit . . . . . 1. *O. setosissima.*

a. Nutlets never conspicuously winged, sometimes with an acute margin simulating a narrow wing; plants lower, often tufted; inflorescence bracteate; corolla white or yellow, the tube included or exserted from the calyx, the latter sometimes enlarged in fruit *b.*

b. Inflorescence a virgate spike-like thrysus with all but the uppermost floral leaves much longer than the short cymes; nutlets broadly ovate, lustrous, sparsely rugose or smooth . . . . . 2. *O. virgata.*

b. Inflorescence various but seldom if ever so spike-like and at least the upper floral leaves reduced to comparatively short bracts which slightly if at all exceed the cymes or racemose branches *c.*

c. Corolla white, 3–6 mm. long, the tube not exserted from calyx; nutlets rough or rarely smooth and then the fruit depressed and subglobose (except in *O. salmonensis*); plants usually rather unattractive *d.*

d. Fruit conical; the nutlets smooth and lustrous; pubescence white, not at all fulvescent even in the thyrsoid-glomerate inflorescence; plants not tufted.....3. *O. salmonensis.*

d. Fruit conical, the nutlets rough (or at least wrinkled), or if smooth, fruit depressed-globular; pubescence, especially in the inflorescence, often fulvescent; plants various in habit *e.*

e. Nutlets more or less rugose (cf. *O. aperta*), often muriculate as well; plants usually biennial or scarcely more enduring, mostly from a taproot; stems usually 1–4 dm. high (*O. sericea* & *O. humilis* are low cespitose perennials) *f.*

f. Calyx-lobes ovate-lanceolate, little exceeding the mature nutlets; inflorescence a rather few-branched panicle *g.*

g. Pubescence on leaves and calyx appressed; nutlets tuberculately rugose.....4. *O. elata.*

g. Pubescence on calyx spreading; nutlets reticulately rugose, the surface appearing nearly foveolate.....5. *O. Bakeri.*

f. Calyx-lobes lanceolate or linear, much exceeding the nutlets; inflorescence thrysoid-glomerate (rarely paniculate) *g.*

g. Biennials or short-lived perennials, not, or scarcely, tufted (*O. celosioides*, sometimes perennial) *h.*

h. Flowers in axillary and terminal panicled racemes; nutlets sharply carinate.....6. *O. insolita.*

h. Flowers thyrsoid-glomerate or in an open thrysus, not in panicled racemes; nutlets with rounded or merely acute backs *i.*

i. Nutlets confluently tuberculate so as to form semi-star-shaped designs; inflorescence an open branched thyrsus.....7. *O. aperta.*

i. Nutlets more or less distinctly rugose, the elevations never confluent into star-shaped designs *j.*

j. Inflorescence a broad open thyrsus, the branches usually branched; nutlets ovate to broadly ovate *k.*

k. Nutlets ovate with sharply acute or slightly winged margin, not ridged.....8. *O. thyrsiflora.*

k. Nutlets broadly ovate or almost oval, distinctly but narrowly winged and rather strongly ridged.....9. *O. virginensis.*

j. Inflorescence, at least in anthesis, a narrow more or less spike-like thyrsus; nutlets ovate-lanceolate *k.*

k. Stems simple, or several from the base, and then the central usually the largest *l.*

l. Leaves not satiny; stiffish hairs present and more or less spreading *m.*

m. Leaves obovate, spatulate or oblanceolate *n.*

n. Nutlets ovate, rugose, indistinctly muriculate, acutely margined, 3.5–5.5 mm. long; species of the Northwest . . . . . 10. *O. celosioides.*

n. Nutlets narrowly ovate, rugose and muriculate, usually less acutely margined, about 3 mm. long; species of the eastern Rocky Mountains.

Stem simple or several from the caudex; lower leaves obovate. 11. *O. glomerata.*

Stems simple or with several distinctly secondary branches from the base; lower leaves oblanceolate . . . . . 12. *O. affinis.*

m. Leaves linear or narrowly oblanceolate . . . . . 13. *O. Macounii.*

l. Leaves satiny above; stiffish hairs present on the under surface only . . . . . 14. *O. argentea.*

k. Stems 2–many, tufted; leaves strikingly setose-ciliate . . . . . 15. *O. spiculifera.*

g. Perennials, tufted *h.*

h. Nutlets more or less rugose and somewhat muriculate *i.*

i. Inflorescence congested even in fruit, the pedicels very short; calyx-lobes less than 5 mm. long . . . . . 16. *O. sericea.*

i. Inflorescence moderately open in fruit, the pedicels becoming 5 mm. long, the calyx-lobes about 6 mm. long . 17. *O. echinoides.*

h. Nutlets not at all muriculate but somewhat rugose, the rugae low and blunt, the surface appearing merely wrinkled . . 18. *O. nubigena.*

e. Nutlets (cf. e^3) never truly rugose, but if tuberculate, some of the tubercles often somewhat confluent; tufted perennials with ultimately branched caudices clothed with dead leaf-bases; stems 0.5–1 (rarely 2) dm. high *f.*

f. Leaves satiny-pubescent, apparently with only one sort of closely appressed hairs; nutlets densely muriculate, the muriculations very sharp . . . . . 19. *O. cana.*

f. Leaves canescent but the pubescence evidently of two sorts, a strigose or tomentulose indument interspersed with stiffish more or less spreading hairs *g.*

Leaves tomentose and hispid; nutlets tuberculate, some of the tubercles confluently rugulose . . . . . 20. *O. depressa.*

g. Leaves strigillose and hispid, not or scarcely tomentose; nutlets not at all tuberculate-rugose *h.*

h. Densely cespitose species only about 1 dm. high; inflorescence congested even in fruit *i.*

i. Hispid pubescence of leaves about as evident as the appressed strigillose pubescence *j.*

j. Nutlets sinuously and finely rugulose and minutely papillose; plants of clay or shale slopes . . . . . 21. *O. caespitosa.*

j. Nutlets muriculate, with one kind of papillae; leaves strigillose and hispid; plants of saline flats . . . . 22. *O. Shantzii.*

j. Nutlets muriculate with one kind of papillae; leaves subtomentose and hispid; plants of upland non-saline soils . . . . . 23. *O. dolosa.*

i. Hispid pubescence of leaves more noticeable than the strigillose indument; nutlets muriculate with distinct papillae . . . . . 24. *O. nana.*

h. Plants about 1.5 dm. high, more loosely tufted; inflorescence becoming moderately open in fruit *i.*

i. Branches of inflorescence floriferous from their bases; hispid pubescence of leaves somewhat spreading; nutlets muriculate with distinct papillae . . 25. *O. commixta.*

i. Branches of inflorescence peduncled, especially the lower, floriferous only toward their apices; all pubescence of leaves appressed; nutlets roughened with fine interlaced lines and minute papillae . . . . . 26. *O. propria.*

e. Nutlets smooth or essentially so (except in the Mexican *O. Palmeri*) and separated by an open space, the fruit being depressed-globular; inflorescence racemose-paniculate *f.*

f. Nutlets smooth, lustrous; species not typically Mexican *g.*

g. Stems and leaves very pubescent *h.*

h. Strigosely canescent, the pubescence mostly appressed; plants usually less than 2 dm high.

Stems erect or ascending; keel of nutlet not strongly elevated above scar . 27. *O. suffruticosa.*

Stems subdecumbent; keel of nutlet more or less strongly elevated above scar . . . . . 27a. var. *abortiva.*

h. Hispid with a spreading pubescence, at least the stems; plants often more than 2 dm. high *i.*

i. Pubescence of leaves in part hispid-spreading . . . . . 28. *O. multicaulis.*

i. Pubescence of leaves appressed-canescent, scarcely any of the hairs spreading *j.*
j. Leaves narrowly lanceolate or oblanceolate; inflorescence moderately congested.....28a. var. *cinerea.*
j. Leaves nearly linear, elongate; inflorescence lax.....28b. var. *laxa.*
g. Stems glabrous; leaves glabrous beneath, sparsely pubescent above.....29. *O. pustulosa.*
f. Nutlets rough, opaque; Mexican.....30. *O. Palmeri.*
c. Corolla white or yellow, 7–15 mm. long, the tube distinctly exserted from the calyx or if not, the calyx and corolla-tube both more than 6 mm. long; nutlets rough, or, if smooth, the fruit ovoid-conical, not depressed-globular; plants often attractive, the flowers conspicuous or even showy *d.*
d. Nutlets more or less roughened; leaves spatulate to broadly oblanceolate or obovate; plants often low and densely tufted *e.*
e. Fruit depressed, subglobose, the nutlets usually rather strongly incurved and always more or less separated at the edges, the ventral face with no excavated groove, but the scar sometimes open *f.*
f. Low, densely cespitose perennial with much branched caudex; nutlets sharply rugose; scar with white border and forked at base.31. *O. paradoxa.*
f. Tufted biennial or short-lived perennial from the crown of a taproot; nutlets more or less tuberculate and sparsely rugose, the ventral face strongly keeled.....32. *O. oblata.*
e. Fruit ovoid-conical, the nutlets erect (unless partly aborted), touching at the edges, or, if not, the ventral face with an excavated groove margined by an elevated border *f.*
f. Nutlets papillose or muriculate, not at all rugose; no open groove in the ventral face *g.*
g. Nutlets disk-shaped, margined all around, lustrous.....33. *O. Paysonii.*
g. Nutlets ovate, not margined, dull *h.*
h. Tufted from a much branched caudex; stems 1–1.5 dm. high; inflorescence very yellowish pubescent.....34. *O. fulvocanescens.*
h. Not truly cespitose, 1.5–3 dm. high; inflorescence pallid or slightly yellowish...35. *O. nitida.*
f. Nutlets more or less rugose, sometimes also muriculate; ventral face often with an open excavated groove *g.*
g. Plants inordinately setose-hispid; calyx-divisions linear, in fruit 10–12 mm. long. 36. *O. horridula.*
g. Plants not strongly setose-hispid; calyx-divisions often ovate-lanceolate *h.*
h. Calyx-divisions linear, 8–10 mm. long in flower, 10–15 mm. in fruit; nutlets sharply and interruptedly rugose....37. *O. longiflora.*
h. Calyx-divisions ovate-lanceolate, sometimes linear but always less than 8

mm. long in flower; nutlets strongly rugose, or if tuberculate, some of the tubercles confluent into rugae *i*.

i. Calyx-divisions linear or linear-lanceolate; nutlets with no excavated groove in the ventral face but the scar sometimes open *j*.

j. Calyx-divisions about 5 mm. long in flower, 8–10 in fruit; basal leaves 5–10 mm. broad; nutlets tuberculate, the tubercles in part confluent.....38. *O. Wetherillii*.

j. Calyx-divisions about 6 mm. long, scarcely longer in fruit; basal leaves 2–5 mm. broad; nutlets strongly rugose, keeled.....39. *O. tenuis*.

i. Calyx-divisions ovate-lanceolate; nutlets variously roughened and with an open excavated groove in the ventral face *j*.

j. Nutlets sharply tuberculate and somewhat sinuously rugose.....40. *O. Shockleyi*.

j. Nutlets reticulately rugose, the ridges interlacing, nearly foveolate....41. *O. eulophus*.

j. Nutlets sharply transversely rugose and with minute papillae intervening.....42. *O. flavoculata*.

d. Nutlets smooth, lustrous; leaves linear-lanceolate or oblanceolate, acute or acuminate; plants tufted but never densely so *e*.

e. Flowers bright yellow, in a spicate thyrsus.....43. *O. flava*.

e. Flowers yellowish, in an interrupted thyrsus; fruit somewhat depressed.....44. *O. confertiflora*.

e. Flowers white, in an interrupted thyrsus; fruit conical.....45. *O. leucophaea*.

1. O. SETOSISSIMA (Gray) Greene, Pitt. i. 58 (1887). *Eritrichium setosissimum* Gray, Proc. Am. Acad. xii. 81 (1877). *Krynitzkia setosissima* Gray, l. c. xx. 276 (1885). — Arizona and southern Utah. — UTAH: Fish Lake, Sevier Co., Aug. 25, 1875, *L. F. Ward*; St. George, Washington Co., *Palmer*. ARIZONA: steep rocky slopes, Thompson's Ranch, White Mts., July 14, 1910, *Goodding*, no. 589; about Grand Canon of the Colorado, June 26, 1898, *MacDougal*, no. 165; Flagstaff, 1883, *H. H. Rusby*, no. 306; Fort Apache, June 21–30, *Palmer*, no. 591.

2. O. VIRGATA (Porter) Greene, Pitt. i. 58 (1887). *Eritrichium virgatum* Porter, Hayden Report 479 (1870). *E. glomeratum* (Pursh) A. DC., var. *virgatum* Porter, in Coulter & Porter, Fl. Colo. 102 (1874). *Krynitzkia virgata* (Porter) Gray, Proc. Am. Acad. xx. 279 (1885). — Southeastern Wyoming to Central Colorado. — WYOMING: Sandy slopes, Chug Creek, Albany Co., June 29, 1900, *Aven Nelson*, no. 7338; Telephone Canyon, Albany Co., June 15, 1894, *Aven Nelson*, no. 231. COLORADO: *F. E. & E. S. Clements*, no. 102; Boulder, June 24, 1901, *Osterhout*, no. 2,463; Gould Creek,

Pike's Peak, Aug. 12, 1903, *J. C. Blumer*; mountains on road from Denver to Idaho Springs, Aug. 2, 1872, *Porter*.

This species is often common within the limits of its range and in spring and early summer when other vegetation is still low, with its erect sentinel-like habit, adds a military touch to the otherwise seemingly free and open sweep of hill and plain. The nutlets, though commonly slightly rugose, are sometimes quite smooth. This latter form has been designated forma *spicata* (Rydb.) Macbr. Proc. Am. Acad. li. 546 (1916), i. e. *O. spicata* Rydb. Bull. Torr. Club xxxvi. 678 (1909), and occurs with the typical form.

3. O. SALMONENSIS Nels. & Macbr. Bot. Gaz. lxi. 43 (1916). — Known only by the type from prairies, in loose soil, Salmon, Lemhi Co., Idaho, June, 1896, *Charles L. Kirkley* (R. Mt. Herb.). This plant seems to be biennial.

4. O. ELATA Eastw. Bull. Torr. Club xxx. 241 (1903). — COLORADO: Grand Junction, Mesa Co., May 15, 1892, *Alice Eastwood*.

5. O. BAKERI Greene, Pitt. iv. 92 (1899). — Sage plains of the Mancos River, Montezuma Co., Colorado. I have not seen this species.

6. **O. insolita,** spec. nov., biennis radice tenui; caulibus 1–2, mediocriter hispidis 3–4 dm. altis; foliis radicalibus spathulatis 3–5 cm. longis 5–12 mm. latis strigillosis et paullo adpresse hispidis; foliis caulinis similibus sed gradatim reductis; racemis terminalibus paniculatis vel inferioribus axillaribus-pedunculatis, remotifloris post anthesin; calyce 5-partito laciniis fructiferis 7–8 mm. longis dense hispidis, pilis vix fulvescentibus; corolla alba circa 5 mm. longa, tubo calycem non superante; nuculis ovatis, acute marginatis tuberculato-rugosis et minute muriculatis, acute carinatis. — NEVADA: Los Vegas, May 4, 1905, *Goodding*, no. 2286 (TYPE, Gray Herb., duplicate, R. Mt. Herb.).

Species of unusual aspect, somewhat like that of *O. elata* but with different calyx and pubescence. The nutlets are remarkably carinate for the genus.

7. O. APERTA Eastw. Bull. Torr. Club xxx. 241 (1903). — Apparently known only from Grand Junction, Mesa Co., Colorado. I have seen no collection.

8. O. THYRSIFLORA Greene, Pitt. iii. 111 (1896). *O. hispidissima* (Torr.) Rydb. Bull. Torr. Club xxxiii. 150 (1906). *Eritrichium glomeratum* (Pursh) DC., var. *hispidissimum* Torr. Bot. Mex. Bound. 140 (1859). — Southern Wyoming to western Texas. — WYOMING: Laramie Hills, Albany Co., July 7, 1894, and Chug Creek, June 29, 1900, *Aven Nelson*, nos. 418 & 7306. COLORADO: Callaway Ranch, Larimer Co., June 23, 1890 (R. Mt. Herb.). NEW MEXICO: 1847, *Fendler*, no. 637.

9. O. VIRGINENSIS (Jones) Macbr. Proc. Am. Acad. li. 547 (1916). *Krynitzkia glomerata* (Pursh) Gray, var. *virginensis* Jones, Contrib. W. Bot. xiii. 5 (1910). — UTAH: La Verkin, May 8, 1894, *Jones*, no. 5195 (R. Mt. Herb.); Diamond Valley, May 16, 1902, *Goodding*, no. 830; " southern Utah, northern Arizona, etc.," 1877, *Palmer*; Valley of the Virgin, near St. George, 1874, *Parry*, no. 173.

10. O. CELOSIOIDES Eastw. Bull. Torr. Club xxx. 240 (1903). *O. sericea* Piper Contrib. U. S. Nat. Herb. xi. 482 (1906), not (Gray) Greene. *Krynitzkia glomerata* (Pursh) Gray, Syn. Fl. ii. pt. 1. 429 (1886) as to Washington specimens. — WASHINGTON east of the Cascade Mts.: Wenatchee, May 28, 1899, *Whited*, no. 1099; Spokane, May 16, 1896 & May, 1897, *Piper*, no. 2294; Spokane, June 3 & June 19, 1913, *G. W. Turesson* (R. Mt. Herb.); Rock Island, Kittitas Co., July 11, 1893, *Sandberg & Leiberg*, no. 440; Rattlesnake Mts., Yakima Region, May 11, 1901, *J. S. Cotton*, no. 359; near Columbus, June 10, 1886, *Suksdorf*; Klickitat, June, 1879, *Howell*; 1883, *Brandegee*, no. 996.

Piper may be justified in distinguishing two species here, but if the material from eastern Washington represents a species distinct from that of the Columbia Valley, it cannot bear the name *O. sericea*, which must be used to designate a very different plant of the Rocky Mountains. *O. celosioides* is certainly very closely related to *O. glomerata* but seems to be distinguishable and is geographically removed from that species.

11. O. GLOMERATA (Pursh) Greene, Pitt. i. 58 (1887). *Cynoglossum glomeratum* Pursh, Fl. Am. Sept. ii. 729 (1814). *Myosotis glomerata* Nutt. Gen. i. 112 (1818). *Eritrichium glomeratum* (Pursh) DC. Prod. x. 131 (1846). *Krynitzkia glomerata* (Pursh) Gray, Proc. Am. Acad. xx. 279 (1885). — Alberta to southern Wyoming, Nebraska and the Dakotas. — SOUTH DAKOTA: Cheyenne River, Aug. 10, 1891, *T. A. Williams*; Whitewood, July 7, 1892, *Rydberg*, no. 893 (Rydberg calls this *O. perennis*). NEBRASKA: Fort Robinson, May 21, 1890, *J. M. Bates*. ALBERTA: Lethbridge, June 8, 1894, *John Macoun*, no. 5802. MONTANA: Spanish Basin, Gallatin Co., June 23, 1897, *Rydberg & Bessey*, no. 4883; mouth of Shields River, June 6, 1883, *F. Lamson-Scribner*, no. 174; near Missoula, June 12, 1901, *MacDougal*, no. 169. WYOMING: Powder River, Big Horn Co., July 18, 1901, *Goodding*, no. 287; Uva, July 10, 1894, *Aven Nelson*, no. 388; Cheyenne River, *T. A. Williams*. UPPER MISSOURI: *Dr. Suckley*.

This is the commonest species of its range. It is somewhat variable in habit, size of corolla, and so forth, but the variations seem to represent merely conditions of one species and do not admit of sharp definition. Indeed, it is possible that the scope of this species

should be broadened to include *O. celosioides* and the next, thus more nearly conforming to Gray's interpretation (Syn. Fl. l. c.). Undoubtedly the group is the most complex in the genus and distinctive characters of fruit, so obvious in other groups, here, strangely enough, seem to be mostly lacking.

12. O. AFFINIS Greene, Pitt. iii. 110 (1896). *O. pustulata* Blankinship, Mont. Agric. Coll. Sci. Studies, Bot. i. 96 (1905). — Southern Wyoming. — Birds Eye, Fremont Co., June 24 and June 10, 1910, *Aven Nelson*, nos. 9355 & 9411; Fort Steele, Carbon Co., June 16, 1900 & 1907, *Aven Nelson*, nos. 7428 & 9045; Greene River, June 14, 1898, *Aven Nelson*, no. 4715; Rock River, Albany Co., June 18, 1901, & Salt Creek, Natrona Co., July 9, 1901, *Goodding*, nos. 29 & 230.

This species reaches its typical development on the red clay hills of southeastern Wyoming. Dr. Nelson has observed that it blooms about a month earlier than *O. glomerata* which, about Laramie, at least, persists for two years, or possibly longer, and belongs to the grassy foothills. *O. affinis*, however, becomes perennial westward, and this fact makes it very difficult to distinguish in the herbarium some forms from *O. glomerata*. In general, however, the latter is a larger coarser plant restricted to a more northerly and more eastern range. The perennial state of *O. affinis* has been named var. *perennis* A. Nels., Eryth. vii. 67 (1899), i. e. *O. perennis* (A. Nels.) Rydb., Bull. Torr. Club xxxiii. 150 (1906).

13. O. MACOUNII Eastw. ex Rydb. Bull. Torr. Club xl. 480 (1913). — SASKATCHEWAN: 1858, *Bourgeau*. Also "Carlton House," presumably by Dr. Richardson.

14. O. ARGENTEA Rydb. Bull. Torr. Club xxxi. 637 (1905). — Northwestern Colorado. — Hayden, Routt Co., July 10, 1913, *Osterhout*, no. 4940 (R. Mt. Herb.).

15. O. SPICULIFERA Piper, Contrib. U. S. Nat. Herb. xi. 481 (1906). *O. cilio-hirsuta* Nels. & Macbr. Bot. Gaz. lv. 378 (1913). — Eastern Washington to southwestern Idaho. — IDAHO: Minidoka, Lincoln Co., June 23, 1912, *Nelson & Macbride*, no. 1799; Boise-Payette Project, Canyon Co., June 2, 1911, *Macbride*, no. 875. WASHINGTON: Ritzville, Adams Co., June 6, 1893, *Sandberg & Leiberg*, no. 164.

16. O. SERICEA (Gray) Greene, Pitt. i. 58 (1887). *Krynitzkia sericea* Gray, Proc. Am. Acad. xx. 279 (1885). *Eritrichium glomeratum* (Pursh) DC., var. *humile* Gray, l. c. x. 61 (1875) and Syn. Fl. ii. pt. 1. 196 (1878), in part. — Montana to Utah. — MONTANA: Bridger's Pass, 1856, *Henry Engelmann*. WYOMING: Mammoth Hot Springs, Yellowstone Park, June 1885, *Tweedy*, no. 816.

UTAH: Wasatch Mts., 1844, *Fremont's Expedition;* Grass Valley, May 17, 1875, *L. F. Ward;* City Creek and Emigration Conyons, near Salt Lake, May 28 & April 22, 1908, *Mrs. Joseph Clemens*; near Salt Lake City, April 24, 1907, *A. O. Garrett*, no. 2060a.

When Dr. Gray proposed this species (l. c.) he used an herbarium name which Nuttall had given to a plant now known to be restricted to the Platte River region of western Nebraska and adjacent Wyoming. Dr. Rydberg would retain the name *O. sericea* for that plant, but Gray's use of the name, as indicated by his description, the range he gives and his annotations in the herbarium, shows that he did not know Nuttall's plant. It is true that he took it to be the same as the species he was describing but since he clearly applied the name to the very different Rocky Mountain plant, of which he had plenty of material, it is rather that species that must be known as *O. sericea*, and the use of the name for the Platte River plant unknown to him would be absurd.

17. **O. echinoides** (Jones), comb. nov. *Eritrichium glomeratum* (Pursh) DC., var. *humile* Gray, Proc. Am. Acad. x. 61 (1875), and Syn. Fl. ii. pt. 1. 196 (1878), in part. *Krynitzkia echinoides* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895) in part. *O. humilis* (Gray) Greene, Pitt. iii. 112 (1896). *O. hispida* Nels. & Kenn. Proc. Biol. Soc. Wash. xix. 156 (1906). — Nevada and adjacent California.—NEVADA: Monitor Valley, Utah, July 1865, *Watson*, no. 853; Carson Valley, Ormsby Co., April 24, 1904, *H. G. True*, no. 865 (R. Mt. Herb.). CALIFORNIA: Castle Peak, Nevada Co., Aug. 3, 1903, *Heller*.

For a discussion on the application of the name *O. humilis* see Proc. Am. Acad. li. 548 (1916).

18. O. NUBIGENA Greene, Pitt. iii. 112 (1896). — Eastern California to northern Nevada. — NEVADA: Santa Rosa Mts., July 11, 1898, *Cusick*, no. 2028. CALIFORNIA: Cloud's Rest, Yosemite, 1872, *Gray*.

An effort should be made to secure this species in fruit. The nutlets are not rugose in the usual definite fashion but the surface is nevertheless somewhat wrinkled and this does not seem to be due to drying as the wrinkles persist in fruits softened with hot water. My no. 987 from Silver City, Idaho (in young flower), distributed as *O. flavoculata* ?, probably is of this species.

19. O. CANA A. Nels. Bot. Gaz. xxxiv. 30 (1902). *Krynitzkia sericea* Gray, Proc. Am. Acad. xx. 280 (1885), as to Nuttall's plant only, not as to description nor specimens so labeled by Gray in herb. — Barren hills, western Nebraska and along the North Platte

River into eastern Wyoming. — Platte River, *Dr. Hayden*. NEBRASKA: Scott's Bluff, May 30, 1858, *H. W. Wagner*. WYOMING: gravelly hilltops, Fort Laramie, Goshen Co., June 29, 1901, *Aven Nelson*, no. 8309.

20. **O. depressa** (Jones), comb. nov. *Krynitzkia depressa* Jones, Contrib. W. Bot. xiii. 5 (1910). — Southern Utah and eastern Nevada. — UTAH: among junipers, Modena, Iron Co., June 2, 1902, *Gooding*, no. 996.

21. O. CAESPITOSA A. Nels. Eryth. vii. 65 (1899). — Southern Wyoming and adjacent Idaho. — Clay foothills, Fort Steele, Carbon Co., June 16, 1900, *Aven Nelson*, no. 7255; shale ridges, Bush Ranch, Sweetwater Co., June 10, 1900, *Aven Nelson*, no. 7078; Bitter Creek, Sweetwater Co., June 16, 1898, *Aven Nelson*, no. 4772. IDAHO: clayey hilltops, Montpelier, May 15, 1910, *Macbride*, no. 2.

22. O. SHANTZII Tidestr. Proc. Biol. Soc. Wash. xxvi. 122 (1913). — Saline flats about Salt Lake, Utah. — Tooele, near Grantsville, June 7, 1914, *A. O. Garrett*; Grant's Station, Aug. 6, 1912, *Kearney & Shantz*, no. 3098 (TYPE, in the U. S. Nat. Herb.).

Besides the characters given in the original description the following are noteworthy. Plant about 1 dm. high; inflorescence very bristly with nearly white widely spreading setae; nutlets with an evident but not pronounced dorsal ridge, sharp-edged, not at all rugose, 2.5–3.5 mm. long. I wish to thank Mr. Maxon, associate curator of the National Herbarium, for the loan of the type.

✓ 23. **O. dolosa,** spec. nov., perennis caespitosa 7–10 cm. alta; caulibus striatis adpresse strigosis et mediocriter molliter patenterque hirsutis; foliis radicalibus circa 3 cm. longis circa 4 mm. latis strigosis et cum pilis longioribus firmiusculis adpressis intermixtis; foliis caulinis similibus sed brevioribus; thyrsis spiciformibus 3–5 cm. longis 1.5–2 cm. latis, floris subfasciculatis; calycibus hispidissimis paullo fulvescentibus lobis linearibus fructiferis circa 6 mm. longis; corolla 5 mm. longa, tubo calycem non superante; nuculis ovatis 3 mm. longis subcarinatis dense muriculatis sulco infra medium aperto. — UTAH: college bench, Logan, Cache Co., June 4, 1909, *Charles Piper Smith*, no. 1605 (TYPE, R. Mt. Herb.). IDAHO: Benchland, Pocatello, May 17, 1909, *J. W. Slaughter*, no. 7 (R. Mt. Herb.); Soda Springs, Bannock Co., June 22, 1892, *A. Isabel Mulford*.

Until the fruit is examined this species is very deceiving as in habit and ibescence it resembles *O. sericea* to which the type was referred. This resemblance is purely superficial, however, the plant being related to *O. nana*. The differently, and more densely, pubescent leaves, the scarcely at all tawny pubescence of the inflores-

cence and the broader nutlets with shorter open groove are salient features that distinguish *O. dolosa* from that species. It seems to be confined to northern Utah and adjacent southeastern Idaho.

24. O. NANA Eastw. Bull. Torr. Club xxx. 213 (1903). — Western Colorado. — COLORADO: Grand Junction, May 17, 1892, *Alice Eastwood.*

25. **O. commixta,** spec. nov., perennis cristata 1.5–2 dm. alta; caulibus molliter cum pilis patentibus hirsutis etiam adpresse strigillosis floriferis fere ad basem; foliis radicalibus spathulatis obtusis 4–5 cm. longis 5–8 mm. latis subviridibus adpresse strigillosis et paullo hispidis cum pilis plus minusve patentibus; foliis caulinis paucis oblanceolatis; thyrsis 1–1.5 dm. longis, circa 2 cm. crassis valde setoso-hispidis aliquid fulvescentibus; pedicellis fructiferis circa 5 mm. longis et calycis laciniis 8 mm. longis linearibus vel lineari-lanceolatis; corolla alba 5 mm. longa, tubo 3 mm. longo calycem non superante; nuculis nitidulis ovatis circa 3 mm. longis dorso mediocriter dense muriculatis omnino non rugosis, angulis acute marginatis ad apicem, faciebus ventralibus fere laevibus, sulco angusto fere ad apicem aperto. — UTAH: sandy slides, Juab, Juab Co., June 9, 1902, *Goodding*, no. 1074 (TYPE, Gray Herb., duplicate R. Mt. Herb.). NEVADA: stony benches, Jarbidge, Elko Co., July 6, 1912, *Nelson & Macbride*, no. 1960, & stony slopes, July 8, no. 1980.

This very distinct species was distributed as *O. Eastwoodae* (which is *O. flavoculata*). It is not, however, a member of that group of species, as it has the nutlets and short corolla of *O. nana* and related species. It forms, with *O. propria*, a distinct subgroup in this section of tufted perennials all characterized by muriculate or tuberculate, but not at all rugose nutlets. The long pedicels and relatively long calyx resemble those of *O. humilis* (Gray) Greene and this may be that species in part as interpreted by Greene, Pitt. iii. 112 (1896). But the name *O. humilis* must be used for a plant of Nevada and adjacent California (see Proc. Am. Acad. li. 548 (1916)), the nutlets of which are more or less rugose and only indistinctly muriculate.

26. O. PROPRIA Nels. & Macbr. Bot. Gaz. lxi (1916). — OREGON: chalky hillside, Malheur Valley, near Harper Ranch, June 8, 1896, *Leiberg*, no. 2223; Vale, Malheur Co., May 14, 1896, *Leiberg*, no. 2049.

27. O. SUFFRUTICOSA (Torr.) Greene, Pitt. i. 57 (1887). *O. disticha* Eastw. Bull. Torr. Club xxx. 268 (1903). *Myosotis suffruticosa* Torr. Ann. Lyc. N. Y. ii. 225 (1827). *Eritrichium Jamesii* Torr. in Marcy, Expl. Red. Riv. 262 (1854). *Krynitzkia Jamesii*

(Torr.) Gray, Proc. Am. Acad. xx. 278 (1885), in part. — South Dakota and Wyoming to western Texas, Arizona and Chihuahua, Mexico. — KANSAS: Hamilton Co., Aug. 3, 1895, *Hitchcock*, no. 347. OKLAHOMA: Creek Valley, near Knowles, Beaver Co., May 5, 1913, *G. W. Stevens*, no. 335. WYOMING: Powder River, June 25, 1910, *Aven Nelson*, no. 9379; Platte River at Ferris, July 19, 1898, *Elias Nelson*, no. 4906; Casper, Natrona Co., July 6, 1901, *Goodding*, no. 208. COLORADO: North Denver, Aug. 12, 1910, *Alice Eastwood*. UTAH: Barton Range, San Juan Co., July 13, 1895, *Alice Eastwood*. NEW MEXICO: 1847, *Fendler*, no. 631; 1851, *Wright*; Nara Visa, Aug. 18, 1910, *Geo. L. Fisher*, no. 64. ARIZONA: Cosnino, Aug. 9, 1884, *Jones*, no. 4042 (R. Mt. Herb.). MEXICO: between Casas Grandes & Sabinal, Chihuahua, Sept. 4–5, 1899, *E. W. Nelson*, no. 6350 (R. Mt. Herb.).

27a. var. ABORTIVA (Greene) Macbr. Proc. Am. Acad. li. 547 (1916). *O. abortiva* Greene, Pitt. iii. 114 (1896). *Krynitzkia multicaulis* Torr., var. *abortiva* (Greene) Jones, Contrib. W. Bot. xiii. 5 (1910). — Southern California and southeastern Nevada. — NEVADA: Lee Canyon, Charleston Mts., Clark Co., July 28, 1913, *Heller*, no. 11,016. CALIFORNIA: Bear Valley, San Bernardino Mts., Aug., 1882, *S. B. & W. F. Parish*, no. 1480; and June, 1895, *S. B. Parish*, no. 3694.

28. O. MULTICAULIS (Torr.) Greene, Pitt. iii. 114 (1896). *Eritrichium multicaule* Torr. in Marcy, Expl. Red Riv. 262 (1854). *Krynitzkia Jamesii* (Torr.) Gray, Proc. Am. Acad. xx. 278 (1885), in part. — Colorado to Arizona and western Texas. — TEXAS: Upper Concho, April, *J. Reverchon*; Big Spring, Howard Co., June 11, 1900, *Eggert*. COLORADO: Arboles, June, 1899, *C. F. Baker*, no. 563; Gunnison, July 17, 1901, *C. F. Baker*, no. 455. NEW MEXICO: 1847, *Fendler*, no. 636; 1852, *Wright*, no. 1568; Mangas Springs, Grant Co., May 17, 1903, *Metcalfe*, no. 70. ARIZONA: Outlaw Canyon, Chiracahua Mts., Aug. 6, 1907, *Goodding*, no. 2349; Metcalfe, Oct. 1, 1900, *Davidson*, no. 608.

28a. var. CINEREA (Greene) Macbr. Proc. Am. Acad. li. 546 (1916). *O. cinerea* Greene, Pitt. iii. 113 (1896). *O. Lemmoni* Eastw. Bull. Torr. Club xxx. 239 (1903). — Colorado, New Mexico, Arizona and to Chihuahua, Mexico. — COLORADO: plains, Pueblo, 1873, *Greene*. NEW MEXICO: Mogollon Mts., Socorro Co., Aug. 9, 1903, *Metcalfe*, no. 431. ARIZONA: 1884, *Lemmon*, no. 3303; vicinity of Flagstaff, June 4, 1898, *MacDougal*, no. 49 & 204, and Aug. 16, 1884, *Jones*, no. 4007 (R. Mt. Herb.); rim of Grand Canyon at Grand Canyon, June, 1915, *Macbride & Payson*, no. 950. MEXICO: Casas Grandes, Chihuahua, May 13, 1899, *Goldman*, no. 407 (Nat. Herb.).

Miss Eastwood bases her species (l. c.) on the subrotate corolla with the statement that the corollas of all other known species

"are distinctly salverform." However, the corollas of our material collected by Lemmon are no more nearly rotate than those of many specimens of other species in this group. Otherwise *O. Lemmoni* seems to be one of many states of the var. *cinerea* transitional to the species.

28b. var. **laxa,** var. nov., foliis linearibus, saepius 10 cm. longis; racemis elongatis laxifloris. — MEXICO: sand hills near Paso del Norte, Chihuahua, Sept. 20, 1886, *C. G. Pringle,* no. 776 (TYPE, Gray Herb.).

The printed label bears this statement, — "Narrower-leaved form" — A. Gray. It is, probably, only a sand-hill condition, but it may be considered as an ecological variety worthy designation on account of its very different aspect, caused not only by the long narrow leaves but also by the lax-flowered racemes.

29. O. PUSTULOSA Rydb. Bull. Torr. Club xl. 480 (1913). — Southeastern Utah.—Hammond Canyon, Elk Mts., Aug. 10, 1911, *Rydberg & Garrett,* no. 9569 (R. Mt. Herb.).

This species is unique because of its glabrous stems and lower leaf-surfaces.

30. O. PALMERI (Gray) Greene, Pitt. i. 57 (1887). *Krynitzkia Palmeri* Gray, Proc. Am. Acad. xx. 277 (1885). — MEXICO: Sierra Madre, 40 miles south of Saltillo, Coahuila, March, 1880, *Palmer.*

31. O. PARADOXA A. Nels. Bot. Gaz. lvi. 69 (1913). *O. gypsophila* Payson, Bot. Gaz. lx. 380 (1915). — COLORADO: dry "gyp" hills, Paradox, Montrose Co., June 17, 1912, *Ernest P. Walker,* no. 91; gypsum hill, Paradox Valley, Montrose Co., June 18, 1914, *Edwin Payson,* no. 458.

The description calls for muriculate nutlets but the muriculations are usually more or less confluent into transverse rugae. Payson writes me that in his judgment these plants are the same species, the "yellow corolla-tube" described for *O. paradoxa* being merely a condition of drying since both collections display the same coloration, although *O. gypsophila* was observed to be "pure white in the field." Material of *O. paradoxa* was not at hand at the time *O. gypsophila* was described.

32. O. OBLATA (Jones) Macbr. Proc. Am. Acad. li. 548 (1916). *Krynitzkia oblata* Jones, Contrib. W. Bot. xiii. 4 (1910). — Arizona to southern New Mexico and adjacent Texas. — Add to the specimens already cited by me (l. c.). — NEW MEXICO: Organ Mountains, Dona Ana Co., April 4, 1903, *Wooton* (R. Mt. Herb.). The collection by Jones from Peach Springs, Arizona, and cited by him

(l. c.) as of this species, is, in some part, *O. multicaulis* (Torr.) Greene, var. *cinera* (Greene) Macbr.

33. **O. Paysonii,** spec. nov., ut videtur perennis cristata; caulibus circa 2 dm. altis strigosis et plus minusve hispidis imprimis ad apicem; foliis radicalibus spathulatis acutis vel subacutis circa 5 cm. longis 7 mm. latis canescenti-strigillosis et cum pilis nonnullis longioribus firmiusculis adpressis intermixtis; foliis caulinis paucis sursum gradatim reductis; thyrsis congestis terminalibus vel floribus nonnullis fasciculato-axillaribus; calyce 5-partito laciniis dense albo-hispidis linearibus 7–10 mm. longis; corolla alba 12–15 mm. longa tubo calycem superante circa 3 mm.; fructu plus minusve depresso-globoso angulis lateralibus conniventibus; nuculis nitidulis fere disciformibus et angulis acutissime marginatis, dorso convexiusculis parce sed valde albo-tuberculatis omnino non rugosis, caeterum laevibus, faciebus ventralibus subcarinatis. — New Mexico: Limestone hills, Berendo Creek, Sierra Co., May 12, 1905, *Metcalfe*, no. 1576 (Type, Gray Herb.).

I have seen no *Oreocarya* with nutlets that approach so nearly a disk in shape. The keeled ventral face of the nutlets and the subglobose fruit suggest a relationship to *O. oblata*, but the nutlets touch at the edges and the aspect of the plant is rather that of *O. Wetherillii*. I have named this attractive plant in recognition of the special trips Mr. Edwin Payson made for me to the type-localities of rare Oreocaryas. His collections have been valuable, not only in this work but in that on related genera, so that it seems peculiarly fitting to connect his name with this group.

34. O. fulvocanescens (Gray) Greene, Pitt. i. 58 (1887). *Eritrichium fulvocanescens* Gray, Proc. Am. Acad. x. 61 (1875). *Krynitzkia fulvocanescens* Gray, l. c. xx. 280 (1885). *K. echinoides* Jones, Proc. Calif. Acad. Sci. ser. 2, v. 709 (1895), in part. For a discussion on the proper application of the name *fulvocanescens* see Proc. Am. Acad. li. 547–548 (1916). — Southwestern Colorado, adjacent Utah and northern New Mexico. — Colorado: common on "gyp" hills, Paradox, Montrose Co., June 13, 1912, *Ernest P. Walker*, no. 85; dry mesa, Naturita, Montrose Co., May 4, 1914, *Edwin Payson*, no. 271. New Mexico: near Santa Fe, 1847, *Fendler*, no. 632; hills at Santa Fe, May 13, 1897, *A. A. & E. Gertrude Heller*, no. 3517; Aztec, San Juan Co., Aug. 1899, *C. F. Baker*, no. 561. Utah: Circo, May 2, 1890, *Jones* (R. Mt. Herb.).

35. O. nitida Greene, Pl. Baker. iii. 21 (1901). — Western Colorado. — Grand Junction, May 17, 1892, *Alice Eastwood*; rocky foothill, Paradox, Montrose Co., June 21, 1912, *Ernest P. Walker*, no. 156; Deer Run, Mesa Co., June 11, 1901, *C. F. Baker*, no. 95. — Possibly this plant is only a large variety of *O. fulvocanescens*.

36. O. HORRIDULA Greene, Pl. Baker. iii. 20 (1901). — Western Colorado. — Grand Junction, Mesa Co., June 14, 1892, *Alice Eastwood.*

37. O. LONGIFLORA A. Nels. Eryth. vii. 67 (1899). — Western Colorado, Palisades, Mesa Co., May 14, 1898, *C. S. Crandall*; Delta, Delta Co., May 20, 1911, *Osterhout*, no. 4497; Montrose, Montrose Co., May 23, 1912, *Edwin Payson*, no. 35.

38. O. WETHERILLII Eastw. Bull. Torr. Club xxx. 242 (1903). *Krynitzkia glomerata* (Pursh) Gray, var. *acuta* Jones, Zoe ii. 250 (1891). — UTAH: Cisco, Grand Co., June 2, 1890, *Jones.*

39. O. TENUIS Eastw. Bull. Torr. Club xxx. 244 (1903). — UTAH: Court House Wash, near Moab, June 25, 1892, *Alice Eastwood.*

40. O. SHOCKLEYI Eastw. Bull. Torr. Club xxx. 245 (1903). — Southwestern Nevada. — White Mts., near Sunland, Mineral Co., June 25, 1912, *Heller*, no. 10508.

41. O. EULOPHUS Rydb. Bull. Torr. Club xxxi. 637 (1905). *Krynitzkia mensana* Jones, Contrib. W. Bot. xiii. 4 (1910). — Central Colorado to southern Utah. — COLORADO: McCoys, Eagle Co., June 14, 1903, *Osterhout*, no. 2750 (R. Mt. Herb.); dry mesa, Naturita, May 22, 1914, *Edwin Payson*, no. 337; dry hillsides beneath junipers, no. 670 (R. Mt. Herb.). UTAH: Glenwood, Sevier Co., May 22, 1875, *L. F. Ward.*

42. O. FLAVOCULATA A. Nels. Eryth. vii. 66 (1899). *O. flavoculata* A. Nels. var. *spathulata* A. Nels. l. c. 67; *O. cristata* Eastw. Bull. Torr. Club xxx. 244 (1903); *O. Eastwoodae* Nels. & Kenn. Muhl. iii. 141 (1908), as to description and type, not as to Utah specimens. — Southern Wyoming to western Colorado and eastern Nevada. — WYOMING: Cooper Creek, Albany Co., June 6, 1898, *Elias Nelson*, no. 4337; Evanston, Uinta Co., June 4, 1898, *Aven Nelson*, no. 4513; Steamboat Mt., Sweetwater Co., June 9, 1900, *Aven Nelson*, no. 7090; Kemmerer, Uinta Co., June 1, 1907, *Aven Nelson*, no. 9028; Point of Rocks, Sweetwater Co., June 17, 1901, *Merrill & Wilcox*, no. 457; Fort Steele, Carbon Co., June 18, 1898, *Aven Nelson*, no. 4815. COLORADO: dry hillside, Naturita, April 22, 1914, *Edwin Payson*, no. 246. UTAH: Brush Creek Canyon, Uinta Mts., July 7, 1912, *Goodding*, no. 1282. NEVADA: Mormon Mts., Lincoln Co., July, 1906, *Kennedy & Goodding*, no. 146 (R. Mt. Herb.).

This, and the three preceding plants form a group of closely related species, scarcely distinguishable except by fruit-characters. The nutlets however are peculiar for each species. This should emphasize to collectors the desirability or even necessity of securing Oreocaryas in fruiting condition, and should serve as a warning not to " pass up " plants in the field because they " look the same " as some collected the day before.

43. O. FLAVA A. Nels. Bull. Torr. Club. xxv. 202 (1898). — Southern Wyoming. — Dry sandy soil, Leucite Hills, Sweetwater Co., June 17, 1901, *Merrill & Wilcox*, no. 497, & Washington's Ranch, June 30, no. 726; Cooper Creek, June 18, 1892, *Aven Nelson*, no. 22; dry shale and sandy ridges, Steamboat Mt., Sweetwater Co., June 9, 1900, *Aven Nelson*, no. 7067; sandy slopes, Alcova, Natrona Co., July 1, 1901, *Goodding*, no. 164.

44. O. CONFERTIFLORA Greene, Pitt. iii. 112 (1896). *O. leucophaea* (Dougl.) Greene, var. *confertiflora* (Greene) Parish, Eryth. vii. 95 (1899). *O. lutescens* Greene, Pitt. iv. 93 (1899). *O. lutea* Greene, Muhl. ii. 230 (1906), name only. *O. alata* (Jones) A. Nels. in Coulter & Nelson Man. R. Mt. Bot. 417 (1909). *Krynitzkia leucophaea* (Dougl.) Gray, var. *alata* Jones, Proc. Calif. Acad. ser. 2, v. 710 (1895). — Western Colorado to southeastern California. — COLORADO: dry hills among junipers, June 19, 1915, Grand Junction, *Macbride & Payson*, no. 705; Mesa Co., 1893, *H. C. Long*; Dolores River near Mesa Creek, June 11, 1914, *Edwin Payson*, no. 405. UTAH: Diamond Valley, May 16, 1902, *Goodding*, no. 814; Beaver Dam Mts., May 1874, *Parry*, no. 166. NEVADA: The Muddy Range, Clark Co., April 10, 1905, *Goodding*, no. 2221. NEW MEXICO: *Palmer*, no. 63; Aztec, April, 1899, *C. F. Baker*, no. 562. CALIFORNIA: Silver Canyon, White Mts., Inyo Co., May 9, 1906, *Heller*, no. 8211; Erskin Creek, 1897, *Purpus*, no. 5323; borders of Mojave Desert, May, 1882, *S. B. & W. F. Parish*, no. 1316.

Parish (l. c.) seems to have overlooked the fact that, in addition to the very good fruiting differences between *O. confertiflora* of the Southwest and *O. leucophaea* of the Northwest, the flowers of the latter are pure white. The ranges of these two species do not meet.

45. O. LEUCOPHAEA (Dougl.) Greene, Pitt. i. 58 (1887). *Myosotis leucophaea* Dougl. ex Lehm. Pug. ii. 22 (1830). *Eritrichium leucophaeum* (Dougl.) A. DC. Prod. x. 129 (1846). *Krynitzkia leucophaea* (Dougl.) Gray, Proc. Am. Acad. xx. 280 (1885). — Northern Oregon and Washington east of the Cascade Mts. to British Columbia. — WASHINGTON: arid barrens of the Columbia, *Douglas*; Pasco, May 29, 1899, *Piper*, no. 2987; Egbert Springs, July 4, 1893, *Sandberg & Leiberg*, no. 373; Walla Walla region, June, 1883, *T. S. Brandegee*, no. 997; Morgan's Ferry, Yakima River, June 8, 1884, *Suksdorf*, no. 407; Wallula, Walla Walla Co., May 23, 1903, *Cotton*, no. 1027.

III. NOTES ON CERTAIN BORRAGINACEAE

Lappula bella, spec. nov., perennis, circa 6 dm. alta; caulibus adpresse retrorso-strigillosis; foliis internodiis longioribus caulinis inferioribus oblanceolatis circa 10 cm. longis 1–2 cm. latis apice acutis vel obtusis, basi in petiolum attenuatis, utrinque adpresse strigillosis et margine eciliatis, caulinis superioribus sessilibus oblongis vel ovatis basi haud angustatis; inflorescentia ut apud *L. diffusam*; corollis verisimiliter albis 10–15 mm. latis; corollae appendiculis pubescentibus non latioribus quam longis; nuculae facie dorsali 6 mm. longa; aculeis permultis (24–30), anguste subulatis basi non confluentibus. — CALIFORNIA: common on open slopes, Dorleska, in the Salmon Mts. of Trinity County, altitude 2000 m., July 21, 1909, *H. M. Hall*, no. 8599 (TYPE, Gray Herb.).

Dr. Hall referred this plant to *L. diffusa*, noting on the label the "pure white flowers" and "pubescent appendages." Piper has shown, Bull. Torr. Club xxix. 535 (1902), the specific value of these characters elsewhere in the genus. Furthermore there are in this case other differences of importance. In *L. diffusa* the blue corollas are only 8–10 mm. broad and their glabrous appendages are distinctly broader than long; the dorsal faces of the nutlets are only 4–5 mm. long and the prickles are uniformly fewer (9–14), much more strongly widened, and more or less joined, at the base. The pubescence on the petioles and the lower part of the stems is looser and more spreading than in *L. bella*. *L. subdecumbens* of the Rocky Mts. has white flowers and pubescent appendages but otherwise is not so nearly related to *L. bella* as is *L. diffusa*. The latter has not been found farther south than northern Nevada, its range being from Montana to Nevada and Eastern Oregon to Alberta and British Columbia, and so is far removed geographically.

Lappula pustulata, spec. nov., *L. pinetorum* peraffinis sed cum pilis haud patentibus papilloso-strigillosa; foliis radicalibus spathulatis circa 5 cm. longis 1–1.5 cm. latis basi in petiolum circa 2 cm. longum attenuatis, caulinis oblongo-lanceolatis apice fere obtusis, basi cuneatis 2–4 cm. longis 5–12 mm. latis; floribus ut apud *L. pinetorum*; nuculis magis muriculatis. — MEXICO: sixty miles south of Guadalupe y Calvo, Chihuahua, Aug. 1898, *E. W. Nelson*, no. 4792 (in U. S. Nat. Herb.); hills west of Chihuahua, Oct. 23, 1885, *Pringle*, no. 563 (TYPE, Gray Herb.)

L. pinetorum Greene has also been collected in Chihuahua (*E. W. Nelson*, no. 6137) and this number, like the New Mexican and Arizonan material has soft, not at all papillose, spreading pubescence (especially on the petioles) and decidedly acute leaves. In *L. pustulata* the bases of the hairs are enlarged so as to give the leaf-surface the appearance of being covered with white pustules. Both species are relatives of *L. floribunda* (Lehm.) Greene which, like *L. pinetorum*, has not been reported from Mexico, but seems to be represented there by *E. W. Nelson's* no. 4764 from Durango. The specimen is in full fruit but it is doubtful if flowering material will prove it distinct. In all probability sooner or later other Lappulas of the southwestern United States will be found south of the Mexican boundary.

✓ **Lappula brachystyla** (Gray), comb. nov. *Echinospermum brachycentrum* Ledeb., var. *brachystylum* Gray, Proc. Am. Acad. xxi. 413 (1886). Annua tenuis erecta villosa et adpresse strigillosa, parce ramosa circa 2 dm. alta; foliis oblongis 8–12 mm. longis, radicalibus in petiolum attenuatis ceteris sessilibus; racemis foliaceo-bracteatis; pedicellis fructiferis calyce brevioribus; corolla minuta; stylo breve nuculis non longiore; nuculis tuberculatis facie dorsali convexis vix 2 mm. longis margine inflexo minute aculeato-glochidiatis vel aculeis obsoletis. — British Columbia: Spence's Bridge, Thompson River, May 29, 1885, *James Fletcher*, no. 1553.

Dr. Gray wrote (l. c.) "Our plant accords well with Ledebour's figure (Ic. Fl. Ross. iv. t. 302) except that the style is not exserted beyond the apex of the nutlets." In view of the distribution of *L. Redowskii* Lehm., var. *occidentalis* (Wats.) Rydb., which appears to be more common in Siberia than the species itself, it would not be surprising to find another Asiatic species of this group in the far Northwest. However *L. brachystyla* is a distinct species although it is more closely related to a plant of northern Asia than to any of our Lappulas. Lipsky has shown, Act. Hort. Petrop. xxvi. 553 (1910), that Ledebour included two species in his *Echinospermum brachycentrum*, i. e. his type and *E. rupestre* Schrenk. The drawing of the fruit in Ledebour's figure (l. c.) is of the latter species. In fruiting characters our plant is very near to *L. microcarpa* (Ledeb.) Gürke which, according to Lipsky, l. c., Ledebour confused in his herbarium with *E. rupestre*. In my judgment *L. microcarpa* is the nearest relative of *L. brachystyla*; but the pubescence of the former is mostly appressed on the stem and branches and the style

is long. The Asian species of this group are very closely related and the nomenclature is involved. Lipsky proposes a new species (*E. polymorphum*) apparently without regard for any rules of priority, which he uses for a veritable waste-basket species. However, since our plant has one very evident character (the short style) which separates it from *all* of the Asian forms, it seems best to regard it as a species.

Amblynotopsis, gen. nov. Nuculae erectae, basi ad gynobasin depresso-pyramidatam adfixae ut apud *Allocaryam* ovatae dorso rotundatae fere semper asperatae nec rugosae nec carinatae nec angulatae. Calyx 5-partitus, lobis angustis vel latiusculis, fructifer immutatus vel parum auctus, plus minusve patens, persistens. Corolla et stamina *Cryptanthae*. — Herbae vel plus minusve suffrutescentes mexicanae saepius diffusae humiles vel modice elatae canescenti-strigosae etiam interdum hispidae nunquam papyros herbarii violaceo colore tingentes. Folia alterna, angusta. Racemi simplices vel ramosi; flores parvi pedicellati; pedicellis fructiferis omnino non incrassatis. — Affinis videtur *Allocaryae* sed habitu fere *Heliotropii*. *Krynitzkia* § *Amblynotus* Gray, Proc. Am. Acad. xx. 264 (1885) pro parte, vix *Eritrichium* § *Amblynotus* A. DC. Prod. x. 128 (1846).

Amblynotopsis heliotropioides (A. DC.), comb. nov. *Antiphytum heliotropioides* A. DC. Prod. x. 122 (1846). *Eritrichium heliotropioides* Torr. Bot. Mex. Bound. 140 (1859). *Krynitzkia heliotropiodes* Gray, Proc. Am. Acad. xx. 265 (1885). *Cryptantha heliotropioides* Loes. in Fedde, Rep. Spec. Nov. xii. 243 (1913). (Type of *Amblynotopsis*).

Amblynotopsis floribunda (Torr.), comb. nov. *Eritrichium floribundum* Torr. l. c. *Antiphytym floribundum* Gray, l. c. x. 55 (1875). *Krynitzkia floribunda* Gray, l. c.

Amblynotopsis Parryi (Wats.), comb. nov. *Antiphytum Parryi* Wats. Proc. Am. Acad. xviii. 122 (1883). *Krynitzkia Parryi* Gray, l. c.

Amblynotopsis peninsularis (Rose), comb. nov. *Krynitzkia peninsularis* Rose, Contrib. U. S. Nat. Herb. i. 85 (1890).

It is necessary in accordance with the now almost universally accepted generic limitations in this family, as outlined by Dr. Greene in Pitt. i. 8 et seq., to set aside this natural group of species as a genus, allowing them to stand on a par with the other genera carved from the obviously heterogeneous group, *Krynitzkia*. Considered generically, then, these species stand intermediate between the genera *Allocarya* and *Plagiobothrys*. From *Cryptantha* (the proper name for the restricted *Krynitzkia*), to which one of them has been referred, they are most at variance, not only in habit, but,

what is more important, in the attachment of the nutlets. In that genus the nutlets are affixed by the ventral groove for at least one third or even their entire length to an elevated gynobase. The groove may be closed or open, but it is in every sense of the word, a groove. In *Amblynotopsis* the ventral face is sharply carinate since the nutlets are attached by an infra-medial or basal scar to a low gynobase, quite as in *Allocarya*. However, in the latter genus, the nutlets are dorsally carinate, the pedicels are turbinate-thickened and the habit (*Allocarya* is composed of low speading herbs) is totally different. In *Plabiobothrys* (the other, but more remote, ally), the nutlets are not only carinate but also rugose and their attachment is more nearly medial. The herbage imparts a violet stain to paper and the species are at variance in habit with the group we are considering. But the gynobase and the ventral keel of the nutlets suggest a close relationship after all, to *Amblynotopsis*.

When Dr. Gray revised *Krynitzkia* in the Proc. Am. Acad. xx. 264 (1885) he treated the three species of *Amblynotopsis* then described, together with *Allocarya lithocarya* Greene and *Krynitzkia obovata* (Ledeb.) Gray, under the subgeneric name *Amblynotus*, a name given sectionally by DeCandolle, for one species of *Eritrichium*, i. e., *E. obovatum* (Ledeb.) DC. And indeed, it is surprising how closely this plant simulates the genus *Amblynotopsis* in all fruiting and floral characters. But there the similarity ends. Habitally it is radically different. Moreover, from a geographical point of view, it is extremely improbable that this plant of northern Asia is congeneric with its Mexican allies. Although its relationship is not entirely obvious, it seems quite possible that some day it must be accorded generic rank. Accordingly I have not thought it advisable to take up the sectional name for the American plants but have chosen a new name that indicates their apparent relationship to the Asiatic species.

Amblynotopsis durangensis, spec. nov. Radix ignota; caulibus strictis circa 7 dm. altis parce strigosis; foliis fere linearibus sessilibus apice acutis basi attenuatis utrinque strigillosis 4–10 cm. longis 4–5 mm. latis; superioribus bracteiformibus; racemis axillaribus 1.5–2 cm. longis: corollae faucibus nudis: calycis fructiferi laciniis ovato-lanceolatis acutis vel fere acuminatis 7–8 mm. longis: nuculis laevibus vel solum minute muriculatis. — Mexico: road between San Julian and Ceno Prieto, Sept. 9, 1898, *E. W. Nelson*, no. 4960 (Type, U. S. Nat. Herb.).

Species representing perfectly the generic characters and nearest to *A. floribunda*, from which it may be distinguished by its lack of spreading pubescence, its greener hue, its long narrow leaves and the much longer fruiting calyx. In *A. floribunda* the mature calyx is rarely 5 mm. long. *A. durangensis* comes the nearest to having smooth nutlets of any of the species, their surfaces being very slightly if at all roughened.

✓ Cryptantha leiocarpa (F. & M.) Greene, var. **hispidissima** (Greene), comb. nov. *C. hispidissima* Greene, Pitt. i. 118 (1887). *C. pumila* Heller, Muhl. ii. 242 (1906). Pubescence widely spreading, hispid. — California: Lemmon's Ranch, June, 1887, *Lemmon*, no. 4606; Smith Creek, Santa Clara Co, May 30, 1907, *Heller*, no. 8588; Bodega Bay, Sonoma Co., May 27, 1902, *Heller*, no. 5615; Mt. Tamalpais, Marin Co., June 12, 1906, *Heller*, no. 8403; foothills west of Los Gatos, Santa Clara Co., May 27, 1904, *Heller*, no. 7458; island of Santa Cruz, April, 1888, *Brandegee*; Salinas River, July, 1885, *M. K. Curran*; *Kellogg* (no data); Linda Vista, San Diego Co., July 6, 1915, *Macbride & Payson*.

Greene founded his species on three specimens in which the appressed strigose hairs that characterize *C. leiocarpa* are almost entirely replaced by a hispid spreading pubescence. The flowers, too, are slightly larger. Since then, however, specimens have been found which exhibit these characters in varying degrees. A specific instance is Mr. Heller's number 8403, the type of his *C. pumila*. He distinguishes it (l. c.) from Greene's species by its "smaller corolla and smaller calyx, the segments not 'long-attenuate'." One has only to examine a few specimens in order to become convinced that such characters are too variable to possess any specific value. In Muhlenbergia, ii. 315 (1907) he refers to *C. pumila* his number 8588 and remarks: "Mrs. Brandegee considers this a mere state of *C. leiocarpa* but two plants differing so in habitat and appearance cannot possibly be the same." Unfortunately this specimen is distinctly strigose-canescent as well as hispid. Altogether it seems best to regard these plants which have the pubescence, at least in part, hispid-spreading as representing a recognizable variety.

✓ **Cryptantha Grayi** (Vasey & Rose), comb. nov. *Krynitzkia Grayi* Vasey & Rose, Proc. U. S. Nat. Mus. xi. 536 (1888).

Apparently nearest *C. angustifolia* (Torr.) Greene but obviously very distinct. Vasey and Rose do not cite a type but their descrip-

tion is included among a list of plants collected by Dr. Palmer at Lagoon Head. Our specimen, however, which purports to be a part of the type material, is *Palmer* no. 801 from San Quentin.

Cryptantha holoptera (Gray), comb. nov. *Eritrichium holopterum* Gray, Proc. Am. Acad. xii. 81 (1877). *Krynitzkia holopterum* Gray, l. c. xx. 276 (1885). *Oreocarya holoptera* Greene, Pitt. i. 58 (1887).

When Dr. Gray described this species he compared it with *C. muricata* and *C. leiocarpa*, both typical Cryptanthas. Later (l. c.) he placed it between *C. pterocarya* and *O. setosissima*, and it is in *C. pterocarya* that it finds its nearest relative. Just why Dr. Greene made it a part of *Oreocarya* is not apparent. It is true that its nutlets are winged after the manner of those of *O. setosissima* but in that plant the pedicels are firmly persistent, in perfect accord with the generic character. Moreover, the plant is an *Oreocarya* in aspect, as noticed by Dr. Gray. These facts are not true of *C. holoptera*. Its pedicels are rather readily deciduous and its aspect is exactly that of a *Cryptantha*. The proper disposition of this plant must strengthen *Oreocarya* immeasurably because *Oreocarya* has very little besides aspect to keep it out of *Cryptantha* (a fact realized by its author, l. c. 115). Nevertheless, these genera are always so readily recognized in the field that no one who knows them there would think of uniting them.

Cryptantha pterocarya (Torr.) Greene, var. **cycloptera** (Greene), comb. nov. *Cryptantha cycloptera* Greene, Pitt. i. 120 (1887). Colorado: Grand Junction, May, 1892, *Alice Eastwood*. Utah: southern Utah, 1874, *Parry*. New Mexico: 1851–1852, *Wright*, no. 1570; rocky hillside, Nutt Mt., Sierra Co., May 11, 1905, *Metcalfe*, no. 1573. Arizona: Lowell, May, 1884, *W. F. Parish*, no. 167; near Camp Lowell, April, 1881, *Pringle*, no. 366; Verde River, April 6, 1867, *Dr. Smart*, no. 132; hills near Tucson, April 15, 1884. California: Surprise Canyon, Panamint Mts., April 21, 1891, *Coville & Funston*, no. 720.

When Dr. Greene described this plant, Bull. Calif. Acad. i. 207 (1885), he accredited it with three characteristics, "nutlets all winged; wings . . . continuous across the base [of the nutlet]; ventral face not muricate." Dr. Gray, commenting in the Synoptical Flora upon these characters, wrote that they "do not hold out." But more recently Mr. Coville, after collecting both species in the Death Valley, wrote (Contrib. Nat. Herb. iv. 165), that he "had not found a satisfactory series of intergrades" and accord-

ingly he considered *C. cycloptera* a good species. However, a study of the ample material in the Gray Herbarium seems to prove conclusively that it is, at best, only a geographical variety of *C. pterocarya*. In the first place, the ventral face of the nutlets may or may not be smooth in either of the proposed species. Secondly, all of the nutlets may be winged and yet the wings not extend across the base, as for example in the plants collected at Grand Junction, Colorado, by Alice Eastwood. When one considers the fact that the ventral faces of these winged nutlets are rough, one is puzzled as to whether the plants are more nearly related to *C. pterocarya* or to *C. cycloptera*. However, it must be noted that it is only the southwestern material that can be referred to *C. cycloptera*. It seems advisable, therefore, to consider *C. cycloptera* as a variety of *C. pterocarya* and to include in this variety all specimens that have four winged nutlets, irrespective of whether the wing extends across the base. Although the species ranges from Washington to Utah and southern California, the variety apparently largely replaces it, in the interior of the Southwest.

Cryptantha filiformifolia, spec. nov., humilis, 5–10 cm. alta, non vel vix ramosa cum pilis patentibus hispida; foliis fere filiformibus 0.5–3 cm. longis raro 1 mm. latis; cymis brevibus circa 1.5 cm. longis 2–3-radiatis, spicis fructiferis densifloris; floribus minimis; calycis fructiferi laciniis 1 mm. longis; nuculis (4) ovato-trigonis circa 5 mm. longis dorso muriculatis, sulco ventrali albido fere ad apicem dilatato et excavato. — MEXICO: Alamos, Sonora, March 26–April 8, 1890, *Palmer*, no. 397 (TYPE, Gray Herb.), and Feb. 2, 1899, *Goldman*, no. 308 (U. S. Nat. Herb.); Cape St. Lucas, etc., Lower California, Aug. 1859–Jan. 1860, *L. J. Xantus*, no. 76; Guaymas, 1890, *Palmer*, no. 169 ? (immature).

Vasey and Rose, in their report on Palmer's collections from La Paz, Lower California, Contrib. U. S. Nat. Herb. i. 73 (1890), refer his no. 111 from that station to *Krynitzkia micromeres* Gray, with the remark "This differs somewhat from the northern forms of this species but it seems to be the same as Xantus's no. 76, made a part of this species by Gray." I have not seen Dr. Palmer's specimen but it is evidently *C. filiformifolia*. Xantus's specimen is only a scrap and it is not surprising that Dr. Gray referred it to his species; but he based his description on the Californian material. In 1891 Dr. Rose (l. c. 107) listed what I have taken as the type of my species as *K. micromeres* Gray without other comment than,

" very common on sandy bottoms." With these several collections before me, however, the plant is seen to be nicely distinct from the Californian species *C. micromeres*. The most striking differences are its uniformly small size, almost filiform leaves, congested fruiting calyces and different nutlets. The groove is so dilated that it occupies the larger part of the ventral face of the nutlet. The nutlets suggest those of *C. Grayi* (Vasey & Rose) Macbr. but that species has conspicuous flowers and is otherwise different. *C. filiformifolia* does not seem to have crossed the mountains of Lower California to the West nor the Sierra Madre of Mexico to the east.

Cryptantha micromeres (Gray) Greene, var. **cryptochaeta,** var. nov., hispida et adpresse strigoso-canescens; nuculis vix muriculatis vel scabridis. — Lower California: San Jose del Cabo, March–June, 1897, *A. W. Anthony*, no. 347 (Type, Gray Herb.).

The variety, because of the appressed hairs beneath the spreading hispid ones, is not green like the typical form of the species. In Anthony's specimen the branches of the inflorescence are not nearly so widely divaricate as in typical material and the calyces are less densely setose. However, ample collections are needed to prove the value of these apparent differences. Accordingly it seems better not to give the plant of Lower California specific rank at this time.

Cryptantha seorsa, spec. nov., humilis adpresse strigillosa et minute hispida a basi ipsa ramosa et florens; foliis caulinis inferioribus lineari-lanceolatis 2–2.5 cm. longis 1.5–2 mm. latis, superioribus ovatis acutis 1–2 cm. longis e basi 3–5 mm. latis supra papilloso-hispidis; cymis saepius 2–3-radiatis, spicis densifloris; calycis fructiferi laciniis linearibus 4–5 mm. longis basi ad apicem aequabiliter setoso-hispidis; nuculis (4) nitidulis 1.5 mm. longis ovatis acutis, dorso vix tuberculatis angulis lateralibus acutis faciebus ventralibus planis, sulco fere ad apicem aperto e basi furcato. — California: Needles, May 6, 1884, *Jones*, no. 3841 (Type, Gray Herb.).

This seems to be very different from any described species and apparently is nearest *C. intermedia* (Gray) Greene, but the acutely angled nutlets with flat ventral surface forbid its reference to any of the members of that group. These nutlet-characters suggest the group that contains *C. oxygona* (Gray) Greene and *C. ramosissima* Greene, but the plant is obviously not related to these species.

C. affinis (Gray) Greene. To the synonomy of this species may be added *C. geminata* Greene, Pitt. i. 119 (1887). The characters

Greene gives, particularly the character of the groove near the edge of the nutlet, are salient features of the type of *C. affinis*. *C. confusa* Rydb. Bull. Torr. Club xxxvi. 679 (1909) seems to be separable only by the use of superficial and arbitrary characters. The variation in leaf-breadth appears to be merely a condition and the same may be true of the slightly higher attachment of the nutlets.

C. RAMULOSISSIMA A. Nels. Eryth. vii. 68 (1899). This species is near *C. Torreyana* (Gray) Greene, but the habit and pubescence are different, the nutlets are more slender, and the areola is open instead of closed. But *C. flexuosa* A. Nels. in Coulter & Nelson, N. Man. Rocky Mt. Bot. 416 (1909), is *C. Torreyana* (Gray) Greene, var. *calycosa* (Gray) Greene (*C. calycosa* (Gray) Rydb.). The variety is more common than the typical form with which it merges. *C. incana* Greene, Leaflets i. 79 (1904), is apparently a specimen of *C. Torreyana* which is more canescent than usual.

C. MICROSTACHYS Greene. *C. Clevelandi* Greene, Pitt. i. 117 (1887), is not to be distinguished.

C. HILLMANII Nels. & Kenn. Proc. Biol. Soc. Wash. xix. 157 (1906), has been referred to *C. Watsoni* (Gray) Greene by Dr. Rydberg, Bull. Torr. Club xl. 481 (1913). This is an error, which may have been prompted by the distribution from the Rocky Mountain Herbarium of specimens determined as *C. Hillmanii*, when they really belong to *C. Watsoni*. The former species is characterized by a large solitary nutlet and is nearest *C. Suksdorfii* Greenm. *C. Watsoni*, on the other hand, matures four small nutlets and is related to *C. Torreyana*. Its stems and calyces are much more bristly than those of *C. Hillmanii*. Since these species have been confused it seems desirable to cite representative collections. Specimens in the Gray Herbarium of *C. Watsoni*: IDAHO: sandy slopes, New Plymouth, Canyon Co., May 21, 1910, *Macbride*, no. 81. WYOMING: Point of Rocks, June 15, 1898, *Aven Nelson*, no. 4736; Centennial Hills, July 16, 1895, *Aven Nelson*, no. 1684. UTAH: Wasatch Mountains, July, 1869, *Watson*, no. 858. NEVADA: Mount Grant, Mineral Co., July 2, 1913, *Heller*, no. 10,905, and Goldfield, July 16, 1913, no. 10,970 in part. OREGON: clay banks, Malheur Butte, Malheur Co., May 12, 1896, *Leiberg*, no. 2041 in part. Specimens of *C. Hillmanii*. IDAHO: Snake Plains, 1893, *Palmer*, no. 72, *Henderson*, no. 2561 (no other data). COLO-

RADO: dry mesa among junipers, Nucla, June 4, 1914, *Edwin Payson*, no. 395. ARIZONA: Grand Canyon, June 28, 1898, *MacDougal*, no. 184.

C. OXYGONA (Gray) Greene is either little known or very rare. The type came from " hills bordering the Mohave Desert," and on April 28, 1905, Mr. Heller secured it at McKittrick, Kern County. Unfortunately he distributed it (under his number 7789) as *C. cycloptera* Greene. One plant of this number in the Gray Herbarium is *C. intermedia* (Gray) Greene, but the rest of the collection is very typical *C. oxygona*. The discovery of a new station for this unusual species is of interest.

C. AMBIGUA (Gray) Greene. *C. simulans* Greene, Pitt. v. 54 (1902) is merely a tall specimen of this species. The nutlets are broadly ovate, dull, and are roughened with papillae of two sizes, — the really diagnostic characters of *C. ambigua*. *C. multicaulis* A. Nels. Bot. Gaz. xxx. 183 (1900) is closely allied to *C. ambigua* but is clearly distinct by its more compact habit and glossy, sparsely muriculate fruit. Its range in the Coulter & Nelson Rocky Mt. Bot. is given as " Wyoming and probably southward into Colorado." In reality specimens indicate that it is not infrequent from Montana to Nevada and north to Washington. *C. trifurca* Eastw. Bull. Torr. Club. xxxii. 203 (1905) is nearer *C. multicaulis* than *C. ambigua*, and is probably confined to extreme northern California and southwestern Oregon, an area noted for species peculiar to it.

C. SCOPARIA A. Nels. Bot. Gaz. liv. 144 (1912) is another member of this group and is to be distinguished from *C. multicaulis* by its narrowly conical nutlets with narrow open groove and scarcely forked basal areola. A specimen which has long proven troublesome to students is to be referred to this species. It is W. N. Suksdorf's no. 405, collected June 8, 1884, on plains, at Morgan's Ferry on the Yakima River, southeastern Washington. The original label bears the name *Krynitzkia angustifolia* ?, in Dr. Gray's hand. This has a line drawn through it and on a slip bearing the abbreviation " Syn. Fl.," Dr. Gray wrote, " K. Fendleri." It was on the basis of this specimen that in the Syn. Fl. ii. pt. 1, Suppl. 424 (1886) he extended the range " northwestward to the borders of Washington Territory." Then Piper, in Contrib. U. S. Nat. Herb. xi. 485 (1906), wrote: " Suksdorf's specimen, on the basis of which *C. Fendleri* is included in his list [of the plants of Washington],

seems to be *C. ambigua*." However, the specimen represents perfectly *C. scoparia*, heretofore known only from the plains of western Idaho. This extension of range is not surprising as it simulates the ranges of many other plants, such as *Astragalus Spaldingii* Gray and *Oreocarya spiculifera* Piper.

C. INTERMEDIA (Gray) Greene. *C. echinella* Greene, Pitt. i. 115 (1887), should be referred to this species.

C. RAMOSA (Lehm.) Greene has an exact synonym in *Krynitzkia mexicana* Brandegee, Zoe v. 182 (1904), which was wrongly compared with the very different *C. pusilla* (T. & G.) Greene.

CRYPTANTHA KELSEYANA Greene, Pitt. ii. 232 (1892). This species was described by Greene (l. c.) from one collection, made by him August 6, 1889 at Elliston, Montana. He compared it with *C. Pattersonii*. In 1900 Dr. Rydberg (Mem. N. Y. Bot. Gard. i. 332) referred two other collections to *C. Kelseyana* and, continuing Greene's comparison, wrote, " three [nutlets] are gray, ovate, acuminate, and sparsely tuberculate, the fourth much smaller, red and smooth." This statement agrees in substance with Greene's original description but it does not coincide with the facts as they are illustrated in the Montana specimens. Actually the fourth nutlet is the largest, the species, in this respect, agreeing perfectly with *C. crassisepala*. I have talked with Dr. Rydberg in regard to this discrepancy in the description and he informs me that he is certain that Greene's characterization is incorrect, the error being due, probably, either to the immaturity or the poor development of the original specimen. I had also reached this conclusion because specimens invariably have the fourth and smooth nutlet the largest, and in the twenty-five years elapsing since the discovery of *C. Kelseyana* no plant answering to the original description has been found. Thus interpreted, the species is nearest *C. crassisepala*. It differs in the acute and narrower nutlets, the groove open toward the base and there forked but not excavated; and in the sepals which are not connivent over the mature fruit but open, the midrib only slightly thickened. Since collections representing *C. Kelseyana* have often been confused with *C. crassisepala*, *C. Pattersonii*, *C. ambigua*, or *C. multicaulis*, it seems worth while to cite the following material of the New York Botanical Garden (N. Y.) and the Gray Herbarium (Gr.).

Saskatchewan: 1858, *E. Bourgeau* (Gr.). Assiniboia: Medicine Hat, June 2, 1894, *Macoun*, no. 5803 (N. Y.). Montana: Virginia City, June 25–30, *G. N. Allen* (N. Y.); Melrose, July 6, 1895, *C. L. Shear*, no. 3218 (N. Y.). Wyoming: Pole Creek, Albany County, June 28, 1895, *Aven Nelson*, no. 1335 (N. Y.); Powder River, Natrona County, June 27, 1910, *Aven Nelson*, nos. 9415, 9377a (Gr.); open woods near the river, Fort Steele, Carbon County, June 16, 1907, *Aven Nelson*, no. 9049 (Gr.); Laramie, Albany County, July 7, 1894, & June 12, 1900, *Aven Nelson*, nos. 412, 7280 (Gr.); Natrona County, July 5 & 10, 1901, *Goodding*, nos. 197 & 234 (Gr.). Colorado: mountain sides near Georgetown, August, 1885, *H. N. Patterson* (Gr.); Walsenburg, June 5, 1900, *Rydberg & Vreeland*, no. 5699 (N. Y.); Platte River, Evans, May 30, 1910, *E. L. Johnston*, no. 628 (N. Y.). Utah: deep sand, Ogden, June 23, 1902, *Goodding*, no. 1176 (Gr.).

Eritrichium. Mr. F. W. Wight in his treatment of the American species of this genus, Bull. Torr. Club xxix. 407 (1902), fails to indicate clearly the relationship of our plants to those of Asia and Europe, although he states that there has been " much misapprehension, in regard to some of them, at least." It may be noted that the only constant difference between the European plant, *E. nanum* (All.) Schrad. and *E. elongatum* (Rydb.) Wight, its American representative, concerns the fruit. The nutlets of the European plant have a distinct spreading border or flange (whether entire or toothed); this is lacking in ours, the edges of the dorsal face being slightly elevated as a rather sharp ridge, — or in some species the edges bear a row of teeth. I have seen no indication in our plants that the presence or the absence of these teeth is not a constant, and therefore a good specific, character. *E. elongatum* and *E. argenteum* Wight include most of the material referred to *E. nanum*, var. *aretioides* by Gray, Syn. Fl. ii. pt. 1, 190 (1886). I am unable to see that *E. Chamissonis* A. DC. is distinct from true *E. aretioides* (Cham.) A. DC. The vegetative characters that Mr. Wight relies upon to separate them break down completely in any considerable series of specimens. The real relationship of *E. aretioides* is with *E. villosum* (Ledeb.) Bunge of Siberia. That species has very similar fruits; and it agrees with all the American species in lacking the border to the nutlet which characterizes the European plant, *E. nanum*.

✓ **Amsinckia Lemmonii,** spec. nov., planta ut apud *A. tessellatam* sed corolla infundibuliformi 15–18 mm. longa, tubo calyce 2–3-plo

longiore, faucibus ampliatis, limbo 5–7 mm. longo; staminibus aut faucibus aut tubo corollae insertis; stylo quam calyce rufidulo-hispido paullo vel multo longiore; nuculis eis *A. tessellatae* simillimis sed vix 3 mm. longis et vix rogosis. — CALIFORNIA: Lemmon's Ranch, San Luis Obispo Co., June, 1887, *Lemmon*, no. 4593 (TYPE, Gray Herb.); San Luis Obispo and Monterey Cos., April 15–May 10, 1899, *L. Jared*, no. 4.

According to Kuhn, Bot. Ztg. xxv. 67 (1867), species of *Amsinckia* are dimorphous. Darwin, Different Forms of Flowers, 110 (1877), denied that this is the case, there being simply a large amount of variation in the length of the styles and the insertion of the stamens. But Dr. Gray, Syn. Fl. ii. pt. 1. 197 (1886), wrote "Flowers in most species all heterogene-dimorphous, at least in the insertion of the stamens." However this may be, an examination of a large number of specimens of *A. tessellata* Gray, the closest ally of *A. Lemmonii*, has shown no sign of such variation (or heterostylism) so that the characteristic seems to be peculiar only to certain species, and therefore may be considered valuable for purposes of classification. *A. Lemmonii* is a case in point, since, in contrast to *A. tessellata*, it possesses this variation. In Jared's specimen the stamens are inserted low in the tube and the style is long; corollas of Lemmon's specimens have the stamens at the throat and the style short, but both specimens obviously represent only one species because they are otherwise identical. However, the recognition of *A. Lemmonii* as a species does not depend on the validity of this character, for it is strikingly distinct from *A. tessellata* in its large corolla which gives it the aspect of the remotely related *A. grandiflora* or *A. spectabilis*. Although it has the distinctive tessellated nutlets of its nearest relative, they are much narrower than those of that species in proportion to their length. Miss Alice Eastwood, when studying at the Gray Herbarium, wrote on the sheet of the Jared specimen "n. sp." She has kindly given me permission to describe it, and, since the discovery that the Lemmon specimen belonged with it, she has expressed pleasure over my choice of name.

Myosotis Colensoi (Kirk), comb. nov. *Exarrhena Colensoi* Kirk, Trans. N. Z. Inst. xxvii. 351 (1894), excluding North Island specimen. *Myosotis decora* Kirk acc. to Cheeseman, Man, N. Z. Fl. 462 (1906).

Because Kirk took specimens of *M. saxosa* Hook. f. of North Island to be referable to his species, Cheeseman (l. c.) discarded Kirk's name. But Kirk's description is evidently drawn from the South Island plants, since it does not apply at all to *M. saxosa* but is essentially correct for *M. decora*. The salient character is the short filaments and long anthers, and the description reads "anthers very large, sessile, or nearly so." Since Kirk did not cite a type, his name must surely be retained for the plant he describes, *i. e.* the plant of South Island, even though he regarded as the same a specimen from North Island, which is *M. saxosa*. Accordingly I am making the necessary transfer, *M. decora* having been merely an herbarium name until published by Cheeseman. The species is represented in the Gray Herbarium by a specimen which comes from the Upper Waimakarisi, Canturbury, *Kirk*, and is a co-type of *M. decora*.

374 **Mertensia Meyeriana,** spec. nov., flexuosa 2–3 dm. alta; caulibus gracilibus paullo hirtellis; foliis alternis costa media prominente margine adpresse ciliatis, supra brevissime scabrido-pubescentibus, subtus glabris paullo pallidioribus viridibus; foliis caulinis inferioribus petiolatis 1–2.5 cm. longis 12 mm. latis, basi cuneatis, petiolis subalatis margine obscure ciliatis; foliis superioribus paullo reductis oblongo-lanceolatis subacutis; floribus apice caulis circa 5 subumbellatis; corolla coerulea; pedicellis 4–6 mm. longis strigillosis; calyce 5-partito lobis anguste lanceolatis acutis ciliatis et plus minusve strigillosis 2 mm. longis, post anthesin 3–4 mm. longis costa media prominente; corolla 10–14 mm. longa, tubo limbum subaequante intus glabro; corollae appendiculis glabris obcordatis; stylo 13–16 mm. longo exserto. — China: Zairansk, western Mongolia, May 20, 1911, *F. N. Meyer*, no. 727 (Type, Gray Herb.).

Apparently nearest *M. dahurica* (Fisch.) G. Don, which, however, has linear-lanceolate leaves and very different pubescence. It also may be compared to *M. stylosa* (Fisch.) A. DC., from which it is even more distinct especially in the merely subacute leaves and not at all villous pubescence. Specimens of these species are in the Gray Herbarium. The few Asiatic species described since the publication of DeCandolle's Prodromus all belong to other groups. Among American Mertensias, *M. Meyeriana* suggests, in aspect, some of the *Lanceolatae*, but the long, exserted style is distinctive. Mr. F. N. Meyer during the past nine years has collected in eastern Asia for the United States government, and although he has been primarily interested in plants possessing economic value with a

view toward their introduction into America, he has secured, also, valuable collections of the general flora of the regions he has traversed. It is a pleasure to commemorate his work in naming this attractive Mertensia *M. Meyeriana.*

Mertensia asiatica (Takeda), comb. nov. *M. maritima* (L.) S. F. Gray, subsp. *asiatica* Takeda, Journ. Bot. xlix. 222 (1911). — Japan and eastern Asia north to Kamchatka. — JAPAN: Saghalien, 1861, *Glehn*; Rebun, Kitami, Aug. 15, 1887, *S. Hori*; Ishikari, Yezo, Sept. 10, 1903, *Shintaro Arimoto*; Isoya, Yezo, July, 1883, *S. Takewbu*; Nambu, Nippan, 1865, *Maximowicz*; circa Hakodate, Yezo, 1861, *Dr. Albrecht*; Cape Sangar, 1853–1856, *J. Small.* CHINA: Coast of Manchuria, Coast Province, 1859, *C. Wilford*, no. 1090. KAMCHATKA: 1853–1856, *Mr. Boggs* (this collection in part only).

Takeda, l. c., has indicated the distinctive characters of this segregate of *M. maritima.* However, his description of the floral parts does not wholly coincide with my own observations. It reads: " corolla magna, plus 10 mm. longa. . . . Stamina anthero 2 mm. longo, filamentis aequanti. Stylus inclusus, 8 mm. longus, staminibus superans." An examination of the material cited has given the following data. Corolla 8–10 mm. long; filaments nearly equalling to twice longer than the anthers; style often slightly exserted, 7–9.5 mm. long. The same class of information for *M. maritima* is: corolla 4–6 mm. long; filaments about three times as long as the anthers; style 4–4.5 mm. long, shorter than the stamens. The long style and large corolla are constant characters of all the specimens seen from Japan and adjacent Asia, while the much smaller corolla and shorter style are features of material from Europe, America, and Northeastern Siberia. If it were not for the facts that in all specimens here included in *M. asiatica* the stamens are inserted near the top of the corolla-tube just as in *M. maritima* and that the style is uniformly longer than the stamens, one would one would be inclined to regard the latter character as a dimorphic phenomenon since dimorphism in some form is not rare in the family. *Mertensia alpina,* for instance, exhibits a sort of dimorphism, but specimens from the same region show both long and short styles in correlation with low and high stamen-insertion. Moreover, in the English edition of Knuth's Handbook of Flower Pollination, iii. 138 (1909), we learn that in *M. maritima* " the anthers being at the same level as the stigma automatic self-polli-

nation regularly takes place." This could never happen in the Japanese plant because the stigma (as already indicated) is always raised above the anthers, thus necessitating cross-pollination. All this accords with Knuth's conclusion (l. c. 115), constructed from the observations of many students, that borraginaceous genera with conspicuous flowers " receive such a large number of visits that automatic self-pollination " is excluded. On the other hand, the small scantily nectar-secreting flowers are very rarely visited by insects and almost always pollinate themselves." And Knuth lists no visitors to *M. maritima* although Ekstam and other students of the subject have observed the plants in the field. In all probability *M. asiatica*, so evidently adapted to cross-pollination is visited by insects, and possibly by one or more species with a coordinating range, an interesting point for future observers to determine. Finally, the plant of the Far East in general has more rounded leaves, larger fruiting calyx and more commonly nodding pedicels. The pedicels are often even somewhat contorted in age. Thus this form of the Orient seems to be a species technically and geographically removed from *M. maritima* of northeastern Siberia, northern Europe and northern America.

LITHOSPERMUM RUDERALE Dougl. ex Lehm. Pug. 2, 28 (1830). *L. pilosum* Nutt. Journ. Acad. Phil. vii. 43 (1834). *L. lanceolatum* Rydb. Mem. N. Y. Bot. Gard. i. 333 (1900). *L. ruderale* Dougl., var. *lanceolatum* (Rydb.) A. Nels. Bot. Gaz. lii. 272 (1911).

This plant varies somewhat in the shape of the leaves (linear-lanceolate to lanceolate), the degree of hispidity, especially on the stem, and the size of the nutlets, which may be more or less distinctly bordered at the base with a spreading flange. The original description (based on material in flower) calls for linear leaves and hirsute stem; and Rydberg segregated his *L. lanceolatum* primarily on its lanceolate leaves while Nuttall (l. c. 44) distinguished his *L. Torreyi* on its merely strigose stem. Rydberg also credits his species with having " smaller flowers, larger nutlets and less hispidity." Examination of much material must convince one that Piper's reduction of *L. lanceolatum*, Contrib. U. S. Nat. Herb. xi. 486 (1906), was justifiable, because the variations noted by Rydberg are seen to be present in every degree, and, as suggested by Aven Nelson (l. c.) are obviously largely the result of environment and therefore of an individual rather than of a specific nature.

Incidentally I might mention that besides this great leaf-variation among different clumps of plants, the leaves seem to grow proportionately broader so that, although they may be quite linear while the plant is in flower, by the time it is in fruit they are distinctly of a lanceolate type. The variation in the character of the pubescence on the stem, however, is much better marked, and furthermore, as Rydberg indicates in his Flora of Colorado, 292 (1906), the plants with merely strigose stems have somewhat shorter corollas and are confined to the central Rocky Mountain region. This is *L. Torreyi* of Nuttall, but, since intermediates are frequent, it may become

L. RUDERALE Dougl., var. **Torreyi** (Nutt.), comb. nov. *L. Torreyi* Nutt. Journ. Acad. Phil. vii. 44 (1834).

There is yet another way in which this species varies and that is in the size of the nutlets and the prominence of a flange, or collar-like constriction, around the base. This character was observed by Aven Nelson (l. c.) in a specimen from Idaho and he wrongly applied Rydberg's name, being misled, in part, by the large nutlets attributed to that plant. Although the nutlets of all specimens show a tendency to be constricted at the base, and although they vary from 3 to about 6 mm. long, the plants from southwestern Idaho and eastern Oregon to western Nevada exhibit these characteristics in such a pronounced degree (as well described by Nelson, l. c.) that they seem to merit recognition as a variety, and may bear the name

L. RUDERALE Dougl., var. **macrospermum,** nom. nov. *L. ruderale* Dougl., var. *lanceolatum* A. Nels. Bot. Gaz. lii. 272 (1911) as to description and specimens cited, not *L. lanceolatum* Rydb. Mem. N. Y. Bot. Gard. i. 333 (1900).

LITHOSPERMUM CALCICOLA Robinson, Proc. Am. Acad. xxvii. 182 (1892). *L. Conzattii* Greenm. Field Col. Mus. Bot. Ser. ii. 239 (1912) appears to be only a young state of *L. calcicola*. Greenman wrote (l. c.), " it differs in having larger flowers and smooth nutlets." These are characters which are known to vary greatly in American species, for instance in the *L. angustifolium* group, where the nutlets may be quite smooth or distinctly pitted on the same plant. Although the type of *L. calcicola* has pitted nutlets, some specimens which agree perfectly otherwise, even to having small flowers, have smooth nutlets, as no. 5381 of Purpus from San Luis

Potosi. The size of the flowers is likewise a variable factor in this genus and frequently the earlier flowers are larger than those which appear after fruit has formed. However this may be in the case of *L. Conzattii*, it agrees in all other respects with *L. calcicola*, so that its reduction argues for a better understanding of the latter, which originally was based on a single collection. Thus interpreted, *L. calcicola* seems to be not uncommon from San Luis Potosi to Oaxaca.

LITHOSPERMUM STRICTUM Lehm., var. **calycosum,** var. nov., foliis caulinis oblongis circa 5 mm. latis; calycibus fructiferis elongatis 10–15 mm. longis. — MEXICO: Guanajuato, June, 1907, *A. Dugès*, no. 5 (TYPE, Gray Herb.); San Luis Potosi, 1878, *Parry & Palmer* no. 622; near San Miguelito, San Luis Potosi, 1876, *Schaffner*, no. 728; Ixmilquipan, Hidalgo, July, 1905, *Purpus*, no. 1403.

Like the typical form except for the broader leaves and the accrescent sepals, but the leaves vary from narrowly linear to oblong in the species, the variety merely representing the extreme form, and the sepal-development, although not an unusual phenomenon in many plants, often, as here, seems worthy of note.

Lithospermum obovatum, spec. nov., herbaceum hispidum strictum 1.5–2.5 dm. altum; foliis radicalibus latissimis obovato-spathulatis supra dense subadpresse papilloso-hispidis subtus villoso-hirsutis 4–5 cm. longis 1.5–2.5 cm. latis conspicue pinnativeniis; caulinis oblongis circa 16 mm. longis 4 mm. latis superioribus vix reductis; inflorescentia ut apud *L. cobrense*; corolla (ut videtur aurantiaca) circa 2 cm. longa, tubo 10–14 mm. longo extus villoso, intus glabro vel pubescente faucibus glandulari-granulosis cum incisuris 5 definitis corollae lobis oppositis; limbi lobis rotundatis minute crenulatis; calycis lobis fere linearibus circa 5 mm. longis; nuculis ignotis. — MEXICO: Quebrada Honda, Durango, May 20 & 21, 1906, *Palmer*, no. 216 (TYPE, Gray Herb.).

A species technically very near *L. cobrense* Greene, but seemingly distinct by virtue of the broad basal leaves, shorter cauline leaves, denser pubescence and larger flowers. The scalloped margin of the gland-covered surface of the throat is sharply defined in this plant while in *L. cobrense* the scallops are not at all definite. Striking in the aspect of *L. obovatum* are the remarkable basal leaves.

Macrotomia densiflora (Ledeb.), comb. nov. *M. cephalotes* (DC.) Boiss. Fl. Orient. iv. 612 (1879). *Arnebia cephalotes* DC. Prod. x. 96 (1846). *Lithospermum densiflorum* Ledeb. in Bull. Sci. Petersb.

ii. 312 (1837). *Arnebia densiflora* Ledeb. Fl. Ross. iii. 140 (1846–51). Apparently this beautiful plant has never been properly christened. Its large golden flowers must excite the admiration of those who know it in the field.

Echium micranthum Schousboë, Vextr. Maroko 75 (1800). De Coincy, Journ. de Bot. xvi. 229–231 (1902), in his detailed discussion of the group has given convincing evidence that *E. sabulicolum* Pomel and *E. decipiens* Pomel, Nouv. Mat. Fl. Atl. i. 90 & 91 (1874) are mere variants of his *E. confusum*, l. c. xiv. 298 (1900); also that *E. micranthum* Schousboë (l. c.) " est probablement la forme femelle de l' *E. confusum*," l. c. xv. 312 (1901), and again, " Les formes femelles à petites corolles et à étamines paraissent aussi fréquentes dans la variété *decipiens* que dans le type. C'est alors le *micranthum*," l. c. xvi. 231 (1902). This variation from the normal hermaphrodite flowers is a well-known phenomenon in *Echium vulgare*, cf. Knuth Handb. Fl. Poll. iii. 133 (1909); and de Coincy has also discussed its occurrence, Bull. Herb. Boiss. ser. II. i. 190 (1901). Reference to the original description of *E. micranthum*, however, shows that Schousboë must have had perfect flowers at hand; and it seems to me that his plant was, in all probability, the maritime form described by Pomel, Nouv. Mat. Fl. Atlan. i. 91 (1874), as *E. sabulicolum* which de Coincy, Journ. de Bot. xvi. 229 (1902), considers as " une forme " of his *E. confusum* " mais il ne parait pas opportun d'établir ici une variété qui n'aurait que des limites par trop incertaines." But he makes the combination *E. confusum* Coincy, var. *decipiens* (Pomel) Coincy (l. c. 230), distinguishing the variety principally by its annual duration and simple erect stem. However, this is contrary to the International Rules, according to which the earliest specific name must be retained. Therefore I am making the necessary combinations; and since I agree with de Coincy on the relationships of the variants of this plant, as completely delineated by him (l. c.), it has seemed unnecessary to repeat them here.

Echium micranthum Schousboë, var. **confusum** (Coincy), comb. nov. *E. confusum* Coincy, Journ. de Bot. xiv. 298 (1900).

Echium micranthum Schousboë, var. **decipiens** (Pomel), comb. nov. *E. decipiens* Pomel, Nouv. Mat. Fl. Atlan. i. 91 (1874). *E. confusum* Coincy, var. *decipiens* (Pomel) Coincy, Journ. de Bot. xvi. 230 (1902).

ONOSMA CINEREUM Schreb., var. **stellulatum** (Waldst. & Kit.), comb. nov. *O. stellulatum* Waldst. & Kit. Pl. rar. Hung. ii. 189 (1805); Coste, Fl. Fr. ii. 590 (1903); Brand, Koch's Syn. Deutsch. u. Schweiz. Fl. iii. 1995 (1907). *O. helveticum* Boiss. Diagn. Ser. 1. xi. 111 (1849). *O. echioides* L., var. *stellulatum* (Schreb.) Fiori in Fiori & Paoletti, Fl. It. ii. 364 (1902).

O. cinereum Schreb. Nov. Act. Nat. Cur. iii. 474 (1767) is the earliest designation for this variable and much-named species. For a nearly complete synonomy see Boissier, Fl. Orient. iv. 201–202 (1875). Boissier, apparently overlooking Schreber's name, maintained in specific rank *O. stellulatum* Waldst. & Kit., the form with green often plane leaves and spreading pubescence, and treated as varieties of it the plants with more or less cinereous narrow leaves with revolute margins. However, since *cinereum* is the older specific name, it must be retained for the species. Fiori (l. c.) treats both *O. cinereum* and *O. stellulatum* as varieties of *O. echioides* and Brand (l. c.) writes " Die . . . Arten sind schwer zu unterscheiden und nicht scharf abgegrenzt. Möglicherweise sind es nur Formen einer einzigen Art." Undoubtedly the species tend to merge through the variety *stellulatum* but in general they are distinct enough so that it seems conducive to clearness to keep both species as Boissier, Gürke, Brand, and others have done. In my opinion, however, Fiori is right in his treatment of the several segregates of *O. echioides* that have been proposed, since they all agree with it in having the tuberculate bases of the hairs glabrous. But *O. cinereum* and its relatives are typically well-marked by the stellate-pubescent tuberculate bases of the hairs. Fiori's diagnoses of the typical form and the var. *stellulatum* are good.

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I. A REVISION OF THE NORTH AMERICAN SPECIES OF AMSINCKIA

By J. Francis Macbride

The genus *Amsinckia* reaches its greatest development in California, but several species are indigenous to Oregon and Washington, one has been described from Mexico and one or more are known from western South America as far south as Patagonia. The range of one species apparently extends from northern Idaho and adjacent Washington to Arizona and California but most species are confined, at least as to their indigenous occurrence, to much smaller areas. Several, however, have greatly extended their natural ranges by spreading as weeds. Indeed the weedy character of *Amsinckia* is most pronounced. I have observed species in California and Idaho that, by reason of their aggressiveness, have been able to take possession, as it were, of places laid waste of the indigenous vegetation. There *Amsinckia*, in the most severe colluctation with other native and, more especially, introduced plants that frequent areas where the natural equilibrium of species has been disturbed, has been able, not only to hold its own but often even to flourish at the evident expense or destruction of less aggressive types. One species is a frequent weed in the grain fields of eastern Washington (cf. Piper and Beattie, Fl. of S. E. Wash. 209) and of Idaho, and one or more species have gained a foothold on the Atlantic coast (cf. Taylor, Fl. of New York and Vicinity, 522, and Macbride, Rhodora xviii. 23). But the distribution of *Amsinckia* as a weed is not confined to the United States. I have seen specimens from Australia and as long ago as 1895 Hansen in Bot. Tidss. xix. 302 recorded two species as adventive in Denmark. Moreover Dr. Thellung has written me that "certaines espèces de ce genre se trouvent ça et la adventices en Europe, introduites probablement avec des blés américains; mais il m'a presque toujours été impossible, faute d'un travail d'ensemble, de les determiner exactement et sûrement."

The need of a general revision of the Amsinckias of North America will be apparent when it is stated that no complete treatment has appeared since that by Dr. Gray in the Synoptical Flora ii. pt. 1, 197 (1886) where he recognized only six species and two varieties, practically all that had been proposed at that time. Since then, however, over a dozen species have been described, mostly from California, and although some of these are apparently not valid this study has disclosed five more plants which seem to require characterization. As a result twenty-one species are recognized, three times as many as were recorded in 1886. The justification of this augmentation will be questioned, especially since species in this group have been proverbially difficult of discrimination. However, it is believed that this state of affairs has been induced, at least partly, by the lack of a comprehensive treatment in which the chief characters are brought into contrast. Nevertheless it must be conceded that characters which admit of clean-cut statement are all too few. The ready response of all the species to every change in ecological conditions makes it difficult to determine the reliable diagnostic characters. However I have become convinced that shape of leaves, size of corolla and nature of pubescence are features that are of the utmost importance, in spite of their supposed susceptibility to environment, for the discrimination of species. In view of the fact that fruit-characters are unusually important in the delineation of the components of many boraginaceous genera it might be expected that they would serve as a means of discriminating species in this genus but with few exceptions the variations in the character of the nutlets have not proved stable nor definite enough to warrant their use in classification. Altogether *Amsinckia* is the most perplexing group I have studied and I can only hope that this effort to define its natural components may lead to careful field-work by some one who may then be in a position to prove or correct my interpretation. It is conceivable, with the better understanding gained from field-observation of specific limitations within the group, that it will be found to consist of many more species than the twenty-one here recognized. I feel, however, that in a genus in which the species lend themselves so readily to many diverse environments and are subject, consequently, to the stimulus for great variation, specific lines must not be drawn very fine lest the classification become artificial and thus fail to serve a useful purpose.

I have had the privilege of studying the specimens of *Amsinckia* belonging to the Rocky Mountain Herbarium of the University of Wyoming which collection proved to contain a number of valuable sheets not represented at the Gray Herbarium. In citing these I have indicated them by the abbreviation "R. Mt. Herb." It was also my good fortune during a brief visit at the Missouri Botanical Garden to have the opportunity of examining there the collection in this group a portion of which was loaned to me for further study. These specimens are indicated by the abbreviation "Mo. Bot. Gard."

Key to the Species

a. Nutlets at maturity smooth and polished *b.*
  b. Corolla about 10 mm. long; scar not median.
    Nutlets 4–4.5 mm. long, sharply triquetrous; scar not obvious ..... 1. *A. vernicosa.*
    Nutlets 5 mm. long or longer, not at all triquetrous; scar linear, prominent ..... 2. *A. carinata.*
  b. Corolla 12–15 mm. long; scar of nutlet nearly median ..... 3. *A. spectabilis.*
a. Nutlets more or less roughened, dull or somewhat lustrous *c.*
  c. Nutlets crustaceous, tessellate or tessellate-rugose.
    Corolla 15–18 mm. long; nutlets scarcely 3 mm. long and scarcely rugose ..... 4. *A. Lemmonii.*
    Corolla about 10 mm. long; nutlets 3.5–4 mm. long, usually more or less rugose ..... 5. *A. tessellata.*
  c. Nutlets variously roughened but never tessellate nor tessellate-rugose *d.*
    d. Leaves distinctly denticulate, often more or less repand; coastal species somewhat decumbent at base, or sometimes procumbent *e.*
      e. Nutlets deltoid with flattish back, faintly rugulose and granulate ..... 6. *A. lycopsoides.*
      e. Nutlets ovate-trigonous, distinctly roughened *f.*
        f. Racemes bracteate throughout; insular species. 7. *A. St. Nicolai.*
        f. Racemes ebracteate or the lowest flowers bracted; continental species *g.*
          g. Sepals bearded on the margins with long white hairs ..... 8. *A. barbata.*
          g. Sepals not bearded on the margins with long white hairs *h.*
            h. Mature nutlets black or dark brown, 1–1.5 mm. long, granulate and sharply muricate, indistinctly rugulose ..... 9. *A. intermedia.*
            h. Mature nutlets usually paler in color, over 2 mm. long, muriculate and more or less distinctly rugulose.
              Corolla-limb flaring; nutlets irregularly rugulose ..... 17. *A. Douglasiana.*
              Corolla nearly tubular, the limb narrow; nutlets usually with strongly developed transverse rugae ..... 10. *A. Menziesii.*

d. Leaves entire; species of dry soils, mostly confined to hilly regions of the interior; stems normally erect *i*.

i. Corolla small, rarely over 6 mm. long, the tube often included in the calyx, the limb narrow, usually but slightly wider than the tube or rarely the corolla larger (7–11 mm. long) and then the lower and middle cauline leaves distinctly oblong *j*.

j. Leaves lanceolate or ovate-lanceolate; stems more or less hispid, usually not at all strigose; fruiting-calyx 4–10 mm. long, usually only 5 mm. long.

Fruiting calyx about 5 mm. long; inflorescence terminal or the racemes all from the upper axils . . . . . 10. *A. Menziesii.*

Fruiting calyx about 10 mm. long; racemes from the lower as well as the upper axils . . 11. *A. idahoensis.*

j. Leaves, except the uppermost, oblong or oblong-linear; stems, even at base, distinctly strigose as well as hispid (except in silicicolous plants); fruiting calyx usually long (6–10 mm.).

Corolla bright- or golden-yellow, 5–11 mm. long, the tube distinctly exserted from the calyx; stems hispid, only slightly strigose 12. *A. arenaria.*

Corolla very pale-yellow, nearly white, 5–6 mm. long, the tube included or slightly exserted from the calyx; stems very strigose as well as hispid . . . . . 13. *A. parviflora.*

i. Corolla conspicuous, usually 10–17 mm. long, sometimes shorter but then always with exserted tube and the leaves not oblong; leaves usually ovate-lanceolate, lanceolate or linear-lanceolate; species natives of California *k*.

k. Corolla about 10 mm. long, the tube usually less than two times as long as the calyx *l*.

l. Nutlets never truly echinate but sometimes sharply muricate, especially on the dorsal carination *m*.

m. Pubescence of calyx (including the few bristles) appressed; leaves usually oblong or oblong-lanceolate . . . . . 14. *A. campestris.*

m. Pubescence of calyx consisting of widely spreading setae (usually reddish) and fine appressed hairs; leaves usually ovate-lanceolate *n*.

n. Stems with no bristly hairs but cinereous to the base with a fine subappressed pubescence . . . . . 15. *A. obvallata.*

n. Stems more or less bristly (sometimes glabrous toward the base) *o*.

o. Nutlets less than 3 mm. long; fruiting calyx 4–8 mm. long *p*.

p. Stems and branches subdecumbent with ascending tips; introduced state of . . . . . 9. *A. intermedia.*

p. Stems and branches strictly erect. *q*.

q. Stem toward the inflorescence and the upper leaves cinereous; nutlets covered with blunt tubercles 16. *A. lunaris.*

q. Stem and leaves not at all cinereous: nutlets muriculate and more or less irregularly rugose.
Corolla-limb 5 mm. or less broad; tube 5–7 mm. long; species of the coastal hills from central California southward . . . 17. *A. Douglasiana.*
Corolla-limb flaring, 6-8 mm. broad; tube 8–10 mm. long; species of north-central California . . . . . 20. *A. valens.*
o. Nutlets about 4 mm. long; fruiting calyx 10 mm. or more long . . . . . 18. *A. intactilis.*
l. Nutlets echinate with soft slender prickles . . . . 23. *A. echinata.*
k. Corolla about 15 mm. (13–17) long, the tube two to three times as long as the calyx *r*.
r. Calyx bristly with spreading hairs *s*.
s. Nutlets muriculate and sharply carinate or rugose; pubescence in part appressed-strigose.
Lower cauline leaves linear-oblong or linear-lanceolate, acute or acuminate, less than 10 cm. long; slender plants rarely 4 dm. high . . . . . 19. *A. Eastwoodae.*
Lower cauline leaves oblong-lanceolate, obtusish or acute, 10 cm. or more long; stout plants, 5–10 dm. high . . . . . 20. *A. valens.*
s. Nutlets granular, not sharply carinate nor rugose; pubescence hispid, spreading . . . . 21. *A. inepta.*
r. Calyx villous and hispidulous, the hairs mostly appressed . . . . . 22. *A. microcarpa.*

1. A. VERNICOSA Hook. & Arn. Bot. Beech. Voy. 370 (1840). *A. carnosa* Jones, Contrib. W. Bot. viii. 35 (1898). — CALIFORNIA: White Mts., San Luis Obispo Co., May 2, 1896, *Eastwood*; near Calico, San Bernardino Co., 1884, *Lemmon*, no. 3139; Sunset, Kern Co., April 20, 1905, *Heller*, no. 7722; 1883, *Douglas; Coulter*, no. 496; Sheperd's Cañon, Inyo Co., April 30, 1897, *Jones* (Mo. Bot. Gard.); Loma Paloma, San Rafael Mts., May 20, 1907, *Hall*, no. 7840 (Mo. Bot. Gard.).

2. A. CARINATA Nels. & Macbr. Bot. Gaz. lxii. 145 (1916). — OREGON: Malheur Valley, near Harper Ranch, June 10, 1896, *Leiberg*, no. 2234.

3. A. SPECTABILIS F. & M. Ind. Sem. Hort. Petrop. 26 (1836). *A. vernicosa* Hook. & Arn., var. *grandiflora* Gray in Brewer & Wats. Bot. Cal. i. 525 (1876). *A. grandiflora* Kleeb ex Gray, l. c.; Jepson, Fl. W. Middle Cal. ed. 2, 350 (1911). — CALIFORNIA: Antioch, Contra Costa Co., April 16, 1869, *Kellogg & Harford*; also May, 1883, *Kellogg*.

Greene, Bot. San Fran. Bay Reg. 263, attributes this plant to the "hills east of the Livermore Valley," Alameda County as well as to the vicinity of Antioch. Fischer and Meyer, l. c., give the

habitat as " circa coloniam ruthenorum Ross in portu Bodega." The species has not been found at Bodega but since the ecological conditions are the same as at Antioch, less than a hundred miles away, it may occur there and have been overlooked. On the other hand there is no proof that the plant was found originally in the *immediate* vicinity of Bodega. Therefore the attempt to apply Fischer and Meyer's name to the relatively small-flowered plant common at Bodega is, it would seem, uncalled for. Their description reads, " corolla aurea, limbo 6 lin. in diametro " and " Species pulchritudine florum insignis atque distinctissima," a characterization applicable to but one *Amsinckia* of the region, *A. grandiflora*. The adoption of the name *A. spectabilis* for this plant results in the resurrection of the appropriate name *A. Douglasiana* A. DC. for the coastal species long known as *A. spectabilis*.

4. A. Lemmonii Macbr. Contrib. Gray Herb. xlviii. 50 (1916). — California: Lemmon's Ranch, San Luis Obispo Co., June, 1887, *Lemmon*, no. 4593; San Luis Obispo and Monterey Cos., April 15–May 10, 1899, *Jared*, no. 4.

5. A. tessellata Gray, Proc. Am. Acad. x. 54 (1875). *A. collina* Greene, Man. Bay-Region 263 (1894). *A. pustulata* Heller, Muhl. ii. 243 (1906). *A. tessellata* Gray, var. *macrosepala* Jones, Contrib. W. Bot. xii. 58 (1908). — South-central Washington and northern Idaho to western Arizona and the southern half of California. — Idaho: very common on the Lewiston hills, May 19, 1894, *Henderson*, no. 2812; New Plymouth, Canyon Co., May 20, 1910, *Macbride*, no. 76; Lewiston, 1896, *Heller*, no. 3021 (Mo. Bot. Gard.); near Boise, June 15, 1892, *Mulford* (Mo. Bot. Gard.); Weiser, Washington Co. April 18, 1900, *Jones*, no. 6480 (Mo. Bot. Gard.). Nevada: East Humboldt Mts., July, 1865, *Watson*, no. 846; Goldfield, Esmeralda Co., July 16, 1913, *Heller*, no. 10968; Meadow Valley Wash, April 28, 1902, *Goodding*, no. 638; Eagle Valley, Ormsby Co., June 10, 1902, *Baker*, no. 1045; near Carson City, 1865, *Anderson*. Utah: Black Rock on Salt Lake, June 28, 1910, *Englemann*. Arizona: Grand Cañon, May, 1885, *Gray*; Yucca, Mohave Co., March 12, 1912, *Wooton*; Maricopa, Pinal Co., Feb., May, 1885, *Gray*. California: Argus Mts., Inyo Co., April–Sept., 1897, *Purpus*, no. 5441; Needles, March 20, 1915, *Parish*, no. 9627; Mojave Desert, May 15, 1882, *Pringle*; sand hills west of Laws, Inyo Co., May 8, 1906, *Heller*, no. 8204 (duplicate of *A. pustulata*); near Mt. Diablo, 1860–62, *Brewer*, no. 1119; Kramer, San Bernardino Co., April 13, 1905, *Heller*, no. 7670; between Earlinart and Delano, Tulare Co., March 26, 1914, *Eastwood*, no. 3953. Oregon: Lexington, Morrow Co., May 2, 1894,

Leiberg, no. 11. WASHINGTON: Pasco, Franklin Co., May 29, 1899, *Piper*, no. 2971; North Yakima, May, 1892, *Henderson*, no. 2558; Waitsburg, May 17, 1897, *Horner*, no. R146B365; Sprague, June, *Sandberg & Leiberg* (R. Mt. Herb.).

The very characteristic nutlets readily distinguish this widely distributed species. As in all species the leaves show considerable variation in breadth and the pubescence of the inflorescence is sometimes tawny, sometimes pale in color in individuals from the same locality. A variation in the character of the surface of the nutlets would appear to be of greater moment but it, like the foregoing variations, occurs in every degree. In the original collection the tessellated nutlet-surface was broken somewhat by a few irregular elevations. Often these are so numerous and continuous that they form transverse rugae; again these corrugations are lacking and the surface resembles exactly a pavement (well illustrated by *Purpus*, no. 5441). The variety *macrosepala* Jones is the form with accrescent sepals.

6. A. LYCOPSOIDES Lehm. ex F. & M. Ind. Sem. Hort. Petrop. 26 (1836). *A. lycopsoides* Lehm., var. *bracteosa* Gray, Syn. Fl. ii. pt. I. 198 (1886). *Lithospermum lycopsoides* Lehm. Pug. ii. 28 (1830); Hook. Fl. Bor. Am. ii. 89 (1838). — Coastal region, northwestern Washington. — WASHINGTON: Puget Sound, *Suckley*; 1854, *Cooper*; sandy beach near Fairhaven, Whatcom Co., July 8, 1890, *Suksdorf*, no. 996; Olympic Mts., Clallam Co., June, 1900, *Elmer*, no. 2754 (Mo. Bot. Gard.).

7. A. ST. NICOLAI Eastw. Proc. Cal. Acad. ser. 3, i. 109 t. 8, fig. 7 (1898). — California: sands, San Nicolas Island, April, 1901, *Blanche Trask*, no. 58.

The apparent validity of this unfortunately named species is a strong argument for the incorporation in all rules of nomenclature of a law invalidating this and similar pseudo-binomials.

8. A. BARBATA Greene, Eryth. ii. 192 (1894). — Vancouver Island; introduced in New England. — BRITISH COLUMBIA: Cameron Lake, July 15, 1887, *Macoun*. CONNECTICUT: Southington, May 29, 1895, *Andrews*, no. 474; also June 17, 1897, and 31, 1898, *Bissell*, nos. 12 and 421.

There is an account in Rhodora xviii. 23 (1916) of the occurrence of this species as a weed in New England.

9. A. INTERMEDIA F. & M. Ind. Sem. Hort. Petrop. 26 (1836). *A. maritima* Eastw. Proc. Cal. Acad. ser. 3, i. 110, t. 8, fig. 8 (1898).

A. lycopsoides Gray in Brewer & Wats. Bot. Cal. i. 524 (1876) and Syn. Fl. ii. pt. I. 198 (1886), in part; Greene, Man. Bay-Region 262 (1894); Jepson, Fl. W. Middle Cal. ed. 2, 350 (1911), not Lehm.; *A. spectabilis* Abrams, Fl. Los Ang. 335 (1911), in part, not F. & M. — Along the seaboard, north to Sonoma County. — California: Bodega Bay, Sonoma Co., May 27, 1902, *Heller*, no. 5614; Angel Island, San Francisco Bay, *Vasey*; and April 12, 1904, *Mulliken*, no. 92 (R. Mt. Herb.); Bodega Point, June 29, 1915, *Eastwood*, nos. 4798, 4798a; Lone Mt. near San Francisco, March 27, *Kellogg & Harford*, no. 758 (Mo. Bot. Gard.); coast west of Watsonville, Santa Cruz Co., April 14, 1903, *Baker*, no. 1952; San Simeon Bay, San Luis Obispo Co., 1876, *Palmer*, no. 370; Cypress Point, Monterey Co., July, 1884, *Ball*; coast at Wilmington, Los Angeles Co., 1885, *Nevin*; stems decumbent, grassy places in park, San Diego, Feb. 22, 1916, *Mary F. Spencer*; San Diego, May 4, 1895, *Belle Sumner Angier*, no. 80 (Mo. Bot. Gard.); San Nicolas Island, April, 1901, *Blanche Trask*, no. 59.

The name *Amsinckia intermedia* has been applied to various plants but in its essential characters the seaboard species of central and southern California is the only plant occurring at Bodega Point, the type locality, that agrees at all closely with Fischer and Meyer's description. Miss Eastwood, l. c., in comparing her species with *A. lycopsoides* erred in regarding the description by Fischer and Meyer (l. c.) as the original characterization. The latter species was published by Lehman as *Lithospermum lycopsoides*, Pug. ii. 28 (1830), and according to Hooker, Fl. Bor. Am. ii. 89 (1838) was based on specimens by Scouler from "Straits of de Fuca." That this is correct seems quite probable because the only specimens I have seen that accord with Lehman's complete diagnosis have come from the coastal region of northwestern Washington. This plant is evidently not the same as the coast-plant of California. *A. lycopsoides* F. & M. with " corolla fauce barbata " has not been identified unless Miss Eastwood, l. c., is correct in referring to it a collection she made in Alameda County. If the feature " corolla with bearded throat " is constant this plant would seem to need a name but according to Gray's observations, Proc. Am Acad. x. 53 (1875), the character is reciprocal to the insertion of the stamens and the length of the style. Fischer and Meyer's *A. lycopsoides*, therefore, would appear to be a condition of *A. intermedia* with " staminibus corollae tubo paulo supra basin insertis " and long style. Heller's collection no. 5614 from Bodega Point exhibits

both high and low stamen insertion. Careful field work is needed to show whether this phenomenon is to be regarded as a heterogeneous variation potentially possible for all, or peculiar only to certain species. I have discussed this question, Contrib. Gray Herb. xlviii. 51 (1916), in regard to *A. tessellata* and *A. Lemmonii*.

10. A. Menziesii (Lehm.) Nels. & Macbr. Bot. Gaz. lxi. 36 (1916). *Echium Menziesii* Lehm. Pug. ii. 29 (1830). *A. intermedia* Gray, Syn. Fl. ii. pt. I. 198 (1886), in part; Piper, Contrib. U. S. Nat. Herb. xi. 480 (1906), in part; Piper & Beattie, Fl. N. W. Coast 303 (1915), in part. — Vancouver Island to northern California, Montana, Nevada, and Arizona; introduced in the Middle West. — Illinois: Rantoul, July 5, 1907, *Gleason*. Missouri: along railroad, Courtney, June 2, 1914, *Bush*, no. 7123. Idaho: Hot Hole, East Bruneau, Owyhee Co., July 3, 1912, *Nelson & Macbride*, no. 1895; Silver City, July 13, 1910, *Macbride*, no. 367; Boise, 1892, *Mulford* (Mo. Bot. Gard.); Twin and Shoshone Falls, July 25, 1911, *Nelson & Macbride*, no. 1330 (R. Mt. Herb.). Nevada: Truckee Pass, Washoe Co., June 19, 1906, *Kennedy*, no. 1347 (Mo. Bot. Gard.); Diamond Mts., July, 1868, *Watson*, no. 846, in part; Truckee Pass, June 28, 1907, *Heller*, no. 8649. Arizona: Camp Lowell, April 9, 1881, *Pringle*; Yucca, May, 1882, *Jones*, no. 19. California: Pampa Station, Kern Co., April 11, 1905, *Heller*, no. 7648; Mendocino, June, 1898, *Brown*, no. 814 (Mo. Bot. Gard.). Oregon: in fields, western Oregon, May, 1880, *Howell* (Mo. Bot. Gard.); 1871, *Hall*, no. 404; near Pineville, Aug. 26, 1894, *Leiberg*, no. 809; Pilot Butte, Crook Co., June 5, 1905, *E. Nelson*, no. 827. Washington: Meyer's Falls, Stevens Co., Aug. 21, 1902, *Kreager*, no. 479; Washtucna, Adams Co., May 18, 1903, *Cotton*, no. 985; Wawawai, May 26, 1894, *Piper*, no. 1838; Cheney, 1904, *Mrs. Susan Tucker*, no. 24; Rock Lake, May 30, 1893, *Sandberg & Leiberg*, no. 120; Port Ludlow, Jefferson Co., Aug. 25, 1890, *Binns*; Olympic Mts. 1899, *Grant*, no. 8; San Juan Island, May 10, 1858, *Lyall*; Wenatchee, May 4, 1898, *Whited*, no. 1063; Spokane, July 2, 1896, *Piper*, no. 2275. British Columbia: Revelstoke, July 21, 1890, *Macoun*; Howser Station, June 20, 1905, *Shaw*, no. 735; Victoria, Vancouver Island, May, 1875, 1887, and 1893, *Macoun*, nos. 1378, 685. Yukon: Dawson, June 22 and 23, 1914, *Eastwood*, nos. 336 and 351.

11. A. idahoensis Jones, Contrib. W. Bot. xii. 58 (1908). — Western Idaho to Montana and apparently Oregon. — Montana: near Naxon, Aug. 30, 1895, *Leiberg*, no. 1626. Idaho: Weiser, 1899, *Jones* (Mo. Bot. Gard.). Oregon: Dalles, May, 1860, *Lyall*?

More material of this species is needed from the region of the type before the constancy of the short, branched inflorescence can be fully established. The specimen from Montana has fruits which are exactly the same as those of Jones' plant but the racemes are greatly elongate and do not originate so near the base of the plant.

12. A. ARENARIA Suksd. Deutsche Bot. Monats. xviii. 133 (1900). *A. hispidissima* Suksd. l. c. *A. retrorsa* Suksd. l. c. 134. *A. micrantha* Suksd. l. c. *A. intermedia* Piper, Contrib. U. S. Nat. Herb. xi. 480 (1906), in part, not F. & M. — Washington and Oregon along the Columbia River to northern Idaho. — IDAHO: sandy soil, Nez Perces Co., May, 1892, *Sandberg* (Mo. Bot. Gard.). OREGON: near Hood River, May 23, 1894, *Suksdorf*, no. 2316; Portland, 1886, *Brandegee*. WASHINGTON: west Klickitat Co., May, 1882, *Suksdorf*; Columbia River, west Klickitat Co., May 3, 9, 22, 1891, *Suksdorf*, nos. 2007 and 390; also May 3, 5, 22, nos. 994 and 995.

This species is variable in size of corolla and nutlets and in degree of pubescence — characters upon which Mr. Suksdorf recognizes three additional species. In some cases these variations are considerable but the collections all come from the same region and indubitably, it seems to me, represent only one species genetically. The small flowered condition (*A. micrantha*) suggests *A. parviflora* but this resemblance is, I believe, superficial, and therefore in no manner affects the validity of the latter species which is a native of California and uniformly, even in an introduced state, has very pale as well as small corollas. Indeed the true relationship of *A. arenaria* is more probably with *A. Douglasiana* or one of its relatives.

13. A. PARVIFLORA Heller, Muhl. ii. 313 (1907). — Central California north to Plumas County; introduced outside the state. — IDAHO: Boise, May 6, 1911, *Clark*, no. 12; also June 13, 1892, *Mulford* (Mo. Bot. Gard.); Clearwater, *Spaulding*; Lewiston, April 27, 1896, *Heller*, no. 2985 (Mo. Bot. Gard.). UTAH: Salt Lake Valley, *Miss Van Rensselaer*; Salt Lake City, May, 1869, *Watson*, no. 846; Sulphur Baths, May 23, 1908, *Mrs. Joseph Clemens*; Huntsville, July 25, 1909, *C. P. Smith*, no. 1944 (R. Mt. Herb.). CALIFORNIA: Los Gatos, Santa Clara Co., April 30, 1908, *Heller*, no. 8936b; also Alum Rock Park, no. 8470; Marysville Buttes, Sutter Co., May 6, 1914, *Heller*, no. 11364; Oroville, Butte Co., April 7, 1913, *Heller*, no. 10725; also Chico, 1914, no.

~~11309;~~ Genessee, Plumas Co., July 15, 1907, *Heller & Kennedy*, no. 8850; Susanville, June 26, 1897, *Jones* (Mo. Bot. Gard.); Mormon Bar, April 19, 1903, *Congdon* (Mo. Bot. Gard.). OREGON: Harper Ranch, Malheur Co., May 23, 1896, *Leiberg*, no. 2119. WASHINGTON: wheat fields, Waitsburg, May 12, 1897, *Horner*, no. R147B364; 1889, *Vasey*, no. 422.

The name *A. parviflora* was used by Bernhardi, Del. Sem. Hort. Erf. 1833, for a South American species, but Bernhardi's plant has been considered a synonym of *A. angustifolia* Lehm. Lehmann's name appeared in a seed list (Del. Sem. Hort. Hamb. 7. 1832) but was not published until 1836 by Fischer and Meyer (Ind. Sem. Hort. Petrop. ii. 26) who cite *A. parviflora* as a synonym. Accordingly if Bernhardi's name was accompanied by a diagnosis it should displace the later *A. angustifolia* Lehm. providing it is, as supposed, a synonym of the latter but it seems very probable that Del. Sem. Hort. Erf. (which I have not seen) is a seed list similar to Del. Sem. Hort. Hamb., with the names unaccompanied by descriptions. Of course on the other hand there is the possibility that Lehmann's and Bernhardi's plants were not the same, yet Reiche, Fl. de Chile v. 238 (1910), follows Fischer and Meyer's treatment. Therefore, because of the uncertainty connected with the precise application of these names, it has not seemed necessary nor advisable to change at this time Mr. Heller's well-chosen name for the North American plant.

14. A. CAMPESTRIS Greene, Man. Bay-Region 263 (1894). *A. intermedia* Jepson, Fl. W. Middle Cal. ed. 2, 350 (1911), not F. & M. — Region of San Francisco Bay and northward. — CALIFORNIA: Los Gatos, April 4, 1904, *Heller*, 7282; Stanford University, March 27, 1902, *Baker*, no. 391, in part; Concord, Contra Costa Co., March 4 and 14, 1914, *Eastwood*, no. 3773, and nos. 3774, 3796; Yreka, Siskiyou Co., May 3, 1910, *Butler*, no. 1269 (R. Mt. Herb.); Oroville, Butte Co., March 9, 1913, *Heller*, no. 10683 (Mo. Bot. Gard.); Red Bluff, Tehama Co., April 25, 1911, *W. W. Jones*, no. 268.

The appressed pubescence, especially on the calyx, is the distinctive feature of this species. The stamens are inserted either in the throat or tube of the corolla, as illustrated by Miss Eastwood's numbers 3774 and 3773, respectively.

15. **A. obvallata** Greene, in herb., planta circa 3.5 dm. alta; caulibus adpresse strigillosis ad basem haud hispidis; folliis radi-

calibus ignotis, caulinis paucis gradatim reductis fere oblongis circa 2 cm. longis parce strigillosis et paullo hispidulis cum pilis plus minusve patentibus; racemis demum elongatis; calycis fructiferi laciniis fere linearibus 5 mm. longis strigillosis et paullo hispidis, pilis haud fulvescentibus; corolla circa 10 mm. longa faucibus paullo ampliatis; staminibus faucibus corollae insertis; nuculis vix 2.5 mm. longis subcarinatis dense muriculatis et paullo rugulosis. — California: frequent in low fields, Tracy, San Joaquin Co., April 25, 1903, *Baker*, no. 2779 (Type, Gray Herb.).

The almost entire absence of hispid pubescence, the small remote leaves, and short fruiting calyx are characters that give to this plant a distinctive aspect and seem to justify its segregation from *A. Douglasiana*.

16. **A. lunaris,** spec. nov., erecta circa 6 dm. alta; caulibus mediocriter hispidis et ad apicem dense retrorso-strigillosis; foliis caulinis inferioribus oblongis vel lineari-oblongis circa 3 mm. latis 4 cm. longis hispidulis, pilis basi albo-tuberculatis, superioribus gradatim reductis ovato-lanceolatis canescenti-strigillosis costa media et margine minute hispidis, pilis plus minusve patentibus; calycis fructiferi laciniis linearibus 4–5 mm. longis strigosis et basi papilloso-setoso-hispidis, pilis fulvescentibus; corolla circa 7 mm. longa faucibus mediocriter ampliatis; staminibus 3 in faucibus, 2 in tubo corollae insertis; nuculis sublunatis fere 3 mm. longis valde carinatis albo-tuberculatis haud rugosis. — California: grassy bank near San Mateo, on the Half Moon Bay road, San Mateo Co., May 23, 1907, *Heller*, no. 8555 (Type, Gray Herb.).

A segregate of the next species but apparently very distinct because of the very pubescent upper leaves and the not at all rugose nutlets.

17. A. Douglasiana A. DC. Prod. x. 118 (1846). *A. spectabilis* Gray in Brewer & Wats. Bot. Cal. i. 524 (1876) and Syn. Fl. ii. pt. I. 198 (1886), in large part; Greene, Man. Bay-Region 262 (1894); Jepson, Fl. W. Middle Cal. ed. 2. 350 (1911); Abrams, Fl. Los Ang. 335 (1911), in part, not F. & M. — Sonoma County to San Diego County, mostly west of the Coast Ranges. — California: Santa Rosa Creek, Sonoma Co., March 26, 1902, *Heller & Brown*; Palo Alto, March, 1910, *Mrs. T. C. Pease*; Stanford, April 21, 1902, *Abrams*, no. 2349; Antioch, Contra Costa Co., April 17, 1908, *Heller*, no. 8908; Byron Springs, March 14, 1914, *Eastwood*, no. 3812; Los Gatos, April 23, 1904, *Heller*, no. 7347; Stanford, April 1, 1902, *Baker*, no. 485; also March 27 and May 15, no. 391, in part; Del Monte, April, 1902, *Elmer*, no. 3567; Santa Lucia Mts., March, 1898, *Plaskett*, no. 41; near Monterey, 1832, *Doug-*

las; San Luis Obispo and Monterey Cos., April 15–May 10, *Jared*, no. 3; Ellwood, April 20, 1908, *Eastwood*, nos. 8 and 9; Pasadena, 1901–1905, *Grant*, no. 40; Santa Monica, *Gray*; San Pedro, March 14, 1903, *Abrams*, no. 3140 (?); Bird Rock, April 11, 1914, *Clements*, no. 104; also La Jolla, March 1, nos. 103 and 105; San Diego, March 10, 1903, *Baker*, no. 3424; also *Abrams*, no. 3312; Campo, San Diego Co., May 24, 1903, *Abrams*, no. 3561; in park, San Diego, Feb. 22, 1916, *Mary F. Spencer*; San Bernardino Valley, April 10, 1906, *Parish*, no. 5575 (R. Mt. Herb.); Caliente, Kern Co., April 7, 1905, *Heller*, no. 7618; San Antonio Mts., June 1–3, 1900, *Hall*, no. 1440 (Mo. Bot. Gard.). MEXICO: Encenada, April 10, 1882, *Jones* (R. Mt. Herb.); Jacumba Hot Springs, May 24, 1894, *Schoenfeldt*, no. 3278.

17a. var. **interior,** var. nov., corolla 5–7 mm. longa fere tubulosa; calycis fructiferi laciniis circa 5 mm. longis. — South-central California to Arizona. — CALIFORNIA: between Earlinart and Delano, Tulare Co., March 26, 1914, *Eastwood*, no. 3921 (TYPE, Gray Herb.); also no. 3952; Hanford, Tulare Co., March 24, 1914, *Eastwood*, no. 3840. MEXICO: San Rafael Valley, Lower California, April 18, 1885, *Orcutt*, no. 1255.

This, the most common species of California is, perhaps, the most variable. In its most abundant and most nearly typical form it is an inhabitant of the coastal hill country from the region of San Francisco Bay to San Diego County, but is represented in the interior of the southern part of the state by the variety *interior*. The proper disposition of this inland form is perplexing but by virtue of its relatively dull stem, small corolla and short calyx it appears distinct enough to warrant recognition as a variety, in spite of the fact that plants have been collected which apparently show clear intergradation with the typical form.

18. **A. intactilis,** spec. nov., robusta 3–6 dm. alta ubique plus minusve hispida paullo strigosa; foliis ovato-oblongis vel ovato-lanceolatis acutis circa 3.5 cm. longis (vel plantae in umbra foliis elongatis) pilis basi valde albo-tuberculatis; racemis demum elongatis parce hispidis et crispe puberulis; pedicellis fere 3 mm. longis; calycis fructiferi laciniis ovato-lanceolatis vel anguste lanceolatis 10–12mm. longis hispidis margine dense ciliatis imprimis ad basin cum pilis villosis aliquid fulvescentibus; corolla circa 10 mm. longa tubo calycem superante circa 5 mm. intus glabro vel pubescente faucibus; staminibus tubo corollae paullo supra basin insertis; nuculis ovatis fere 4 mm. longis mediocriter carinatis obscure tuberculatis sed valde rugosis imprimis ad apicem. — CALIFORNIA: near Orland, Glenn Co., May 1, 1914,

Heller, no. 11355 (TYPE, Gray Herb.); Bennett Spring, Glenn Co., June 16, 1915, *Heller*, no. 11985. NEVADA: north of Verdi, Washoe Co., June 24, 1913, *Heller*, no. 10880.

It is difficult to indicate the salient characters of this plant but it seems to be distinct from any described species. The large nutlets and long fruiting calyx are peculiarities that make impossible its reference to any member of the *A. Douglasiana* group of species.

19. **A. Eastwoodae,** spec. nov., usque ad 3–3.5 dm. alta; caulibus infirmis ubique pubescentibus cum pilis patentibus infirmis etiam praecipue ad apicem crispe hirsutulis; foliis internodiis longioribus, caulinis inferioribus lineari-lanceolatis acuminatis 3–7 cm. longis circa 4 mm. latis cum pubescentia ei caulis simile munitis, caulinis superioribus paucis gradatim reductis; racemis ubique ebracteatis setoso-hispidis mediocriter fulvescentibus; calycis fructiferi laciniis circa 7 mm. longis fere linearibus; corolla infundibuliformi 13–17 mm. longa tubo calyce 2–3-plo longiore, faucibus ampliatis; staminibus faucibus corollae insertis; nuculis 2.5–3.5 mm. longis plus minusve serratim carinatis et rugosis et mediocriter dense albo-muriculatis. — CALIFORNIA: near Pollasky, Fresno Co., April 11, 1906, *Heller*, no. 8153 (TYPE, Gray Herb.); Raymond, Madera Co., May 5, 1896, *Clara E. Cummings*; Mariposa, April 19, 1903, *Congdon* (Mo. Bot. Gard.); New York Falls, Amador Co., July, 1895, *Hansen*, no. 1046 (Mo. Bot. Gard.).

This beautiful and distinctive species is probably restricted to Fresno and counties adjacent. Its large corollas are very suggestive of those of *A. Lemmonii* but in fruit characters it resembles *A. Douglasiana*. Students are indebted to Miss Eastwood and Mr. Heller for the largest and most representative collections of *Amsinckia* in herbaria. The latter collector is the author of the widely disseminated *A. parviflora* but Miss Eastwood has not found time to study her collections and they have been mostly distributed unnamed. It seems peculiarly fitting that her name should become connected with this group of plants in which she has taken so great an interest.

20. **A. valens,** spec. nov., robusta 5–9 dm. alta; caulibus mediocriter hispidis haud adpresse strigillosis; foliis caulinis inferioribus oblongo-lanceolatis obtusis vel acutis 10–14 cm. longis 1–1.5 cm. latis utrinque subadpresse papilloso-hispidis, superioribus similibus sed gradatim reductis dense pubescentibus; racemis demum elongatis mediocriter hispidis et plus minusve crispe

puberulis; pedicellis brevissimis; calycis fructiferi laciniis fere linearibus circa 6 mm. longis adpresse villosis et hispidis, pilis aliquid fulvescentibus; corolla 12–15 mm. longa tubo calycem superante circa 5 mm. intus glabro; staminibus faucibus vel tubo corollae insertis; nuculis circa 3 mm. longis mediocriter carinatis valde rugosis et muriculatis. — CALIFORNIA: Anderson, Shasta Co., April 26, 1913, *L. E. Smith*, no. 143 (TYPE, Gray Herb.); Chico, Butte Co., April 21, 1914, *Heller*, 11310; Oroville, Butte Co., March 9, 1913, *Heller*, 10683; Marysville Buttes, Sutter Co., April 3, 1915, *Heller*, no. 11800; Auburn, Placer Co., April, 1895, *Mary E. P. Ames* (Mo. Bot. Gard.).

I cannot refer this large-flowered species to the relatively small-flowered *A. Douglasiana* which is not known to grow north of central California. *A. Eastwoodae*, however, might be interpreted so as to include *A. valens* but unless collections are secured that necessitate a reconstruction of our present conception of the foliage and size of the former species it would be unwise, it seems to me, to consider this huge and coarse plant of more northern range as of the same specific unit.

21. **A. inepta,** spec. nov., ut videtur circa 5 dm. alta; caulibus erectis nitidulis parce setoso-hispidis non omnino strigosis; foliis numerosis lineari-lanceolatis 3–7 cm. longis vix 3 mm. latis longo-acuminatis mediocriter hispidis, superioribus gradatim reductis; racemis ebracteatis; calycis fructiferi laciniis circa 5 mm. longis fere linearibus valde setoso-hispidis aliquid fulvescentibus; corolla circa 15 mm. longa tubo calyce 2–3-plo longiore, faucibus mediocriter ampliatis; staminibus faucibus corollae insertis; nuculis 3 mm. longis vix carinatis vel rugosis et solum minute muriculatis. — LOWER CALIFORNIA: San Martin Island, March–June, 1897, *Anthony*, no. 217 (TYPE, Gray Herb.).

Satisfactory characters with which to separate this species from narrow-leaved maritime specimens of *A. Douglasiana* are not numerous. Nevertheless the somewhat longer corolla and scarcely more than granularly roughened nutlets are features that forbid the reference of *A. inepta* to any form of the mainland plant.

22. A. MICROCARPA Greene, Eryth. ii. 191 (1894). — CALIFORNIA: *Coulter*, nos. 497 and 504; Fort Mojave, April 16, 1861, *Cooper*.

This species appears very distinct by reason of the densely villous and appressed-hispid calyces and the large corollas. The nutlets, however, are often larger than Greene indicated and in

our material by Coulter (presumably duplicates of the type) the full grown calyx is much longer than called for in the original description. An immature specimen from the Yosemite by Clara E. Cummings apparently belongs to this species.

23. A. ECHINATA Gray, Proc. Am. Acad. x. 54 (1875). — CALIFORNIA: Fort Mojave, Feb., 1860–61, *Cooper*; Maricopa, Kern Co., March, 1881, *Parry*, no. 207.

This is a remarkable species and apparently very local. Other specimens referred to it which I have seen belong to *A. Douglasiana* which may have nutlets with a serrated carination but are never truly echinate.

II. FURTHER NOTES ON THE BORAGINACEAE

Cordia Brittonii (Millspaugh), comb. nov. *Varronia Brittonii* Millspaugh, Field Col. Mus. Bot. ser. ii. 311 (1909).

I am unable to see that any good purpose will be served by raising the section *Varronia* to generic rank. Consistency will then demand the recognition of other subgeneric groups as genera thus splitting the reasonable entity long known as *Cordia* into a number of parts that will challenge sharp definition. If the technical characters upon which *Varronia*, for instance, is based, coincided with distinctive traits of aspect its recognition as a genus would appear to be more reasonable. But in *Cordia* there is no agreement of this nature between aspect and diagnostic characters so that plants possessing great superficial resemblances, as for instance many species with capitate inflorescences, for reasons purely technical occur in different sections of the genus. But logically these plants are all Cordias and are recognizable as such by the amateur, so why exaggerate the importance of the more or less obscure technical characters by calling some members of the group Varronias, others Sebestens, etc. to the utter confusion of all but the professional ? Surely the average traveler can learn to recognize a shrub of this alliance as a *Cordia* when he may be unable to assign it to a section which has been set up as a genus.

Cordia imparilis, spec. nov., fruticosa erecta aromatica; ramis teretibus glabris, ramulis rufo-hirsutis (pilis circa 2 mm. longis) et minute strigillosis; foliis (superioribus) ovato-lanceolatis circa 6 cm. longis 2.5 cm. latis basi et apice acutis subremote dentatis

supra scrabris subtus dense pubescentibus cum pilis albis brevissimis, petiolis hirsutis 7–10 mm. longis; spicis cylindraceis densis circa 5 cm. longis, pedunculis circa 3 cm. longis crispe puberulis et cum pilis nonnullis longioribus firmiusculis subadpressis intermixtis; calycibus junioribus globosis dense brevissimis hirsutis; corolla alba 4 mm. longa calyce duplo longiore parce pilosa ad faucem lobis inequaliter denticulatis; staminibus exsertis. — MEXICO: near the boundary of Michoacan and Guerrero, Aug. 1, 1898, *Langlassé*, no. 265 (TYPE, Gray Herb.).

It is with no little hesitation that I propose a plant of this large genus as new. However, apparently no member of the subsection *Spiciformes* occurring in Mexico agrees (at least as described) with the plant here characterized. In some respects it suggests both *C. brevispicata* Mart. & Gal. and *C. ferruginea* R. & S. but differs from both greatly in pubescence and foliage.

HELITROPIUM PHYSOCALYCINUM Donn. Sm. Bot. Gaz. xlix. 457 (1910) has an exact synonym in *H. jaliscense* Macbr. Proc. Am. Acad. li. 542 (1916). The first line of Capt. Smith's description reads "Omnibus fere in partibus glanduliferum." This does not well apply to the type of *H. jaliscense* but neither does it to *Hyde & Lux* no. 3990, the latter cited by Capt. Smith as representing his species. *H. physocalycinum* is very distinctive by virtue of its unique calyx. Since the original diagnosis was accompanied by citations of specimens from Guatemala and Peru only, the following collections showing the distribution of the species in southwestern Mexico may be named. MEXICO: Sierra Madre, Michoacan, June 6, 1898, *Langlassé*, no. 577; San Sebastian, Jalisco, March 16, 1897, *E. W. Nelson*, no. 4083; Talea, Oaxaca, Feb., 1844, *Galeotti*.

OREOCARYA INTERRUPTA Greene, Pitt. iii. 111 (1896). This species, not placed in my recent revision of the genus, is represented at the Mo. Bot. Gard. by Heller's no. 9185 from Humboldt Wells, Elko Co., Nevada, July 27, 1908. It is apparent that the relationship of the plant is with *O. spiculifera* Piper but the tubercles on the much smaller nutlets are not at all confluent into rugae. Nevertheless the habit and vegetative characters simulate *O. spiculifera* rather than any muriculate-fruited species. *O. interrupta*, therefore, seems to be a connecting link between the rugose and non-rugose groups of the small-flowered section of the genus.

LAPPULA CALIFORNICA (Gray) Piper, Bull. Torr. Club. xxix. 546 (1902). Mr. A. A. Heller has distributed recently under his number 12426 a Lappula secured by him June 22, 1916 in Siskiyou County, California, the label of which bears this inscription: "*Lappula bella* Macbride, Cont. Gray Herb. ii. 48: 39. 1916." If Mr. Heller had wished to collect the species most distantly related to *L. bella* he should have selected *L. californica*, which, as a matter of fact is nicely represented by his number 12426! *L. californica* is very common in Siskiyou County.

✓ **Mertensia Eastwoodae,** nom. nov. *M. alaskana* Eastw. Bot. Gaz. xxxiii. 287 (1902), not *M. alaskana* Britton, Bull. N. Y. Bot. Gard. ii. 181 (1901).

In Contrib. Gray Herb. n. ser. xlviii. 7 (1916) the above species were listed as segregates of *M. paniculata*, with the statement, " if I may judge from character alone, these are not worthy specific rank." Since then, however, I have examined a specimen preserved at the Missouri Botanical Garden which purports to be a part of the type collection of *M. alaskana* Eastw. and shows that Miss Eastwood's species is not, in reality, very closely related to *M. paniculata.* Indeed the pubescence on the pedicels is closely appressed, a characteristic which suggests *M. pratensis* and its allies but from which it is at once recognizable by its narrow acuminate leaves and pectinately-rugose fruits. *M. alaskana* Britton on the other hand is a segregate of *M. paniculata* as is shown by Miss Eastwood's no. 94 from Dawson Slide which agrees exactly with the original diagnosis. It is to be distinguished from *M. paniculata* by the glabrous or only ciliate sepals and the somewhat narrower, glabrous (or very slightly pubescent beneath) leaves. Numerous collections from different localities are needed to prove the value of the presence or absence and position of pubescence as a character for distinguishing species in this group.

MERTENSIA GRANDIS Woot. & Standl. Contrib. U. S. Nat. Herb. xvi. 165 (1913). In Contrib. Gray Herb. n. ser. xlviii. 8 (1916) this species was referred to *M. franciscana* Heller. Recently, however I have examined co-type material (*Metcalfe*, no. 1319) of *M. grandis* as preserved at the Missouri Botanical Garden and I now doubt the wisdom of my reduction. The species is indeed very near *M. franciscana* but the corollas are rather of the type of *M. pratensis*, except that they are even larger. Since the species

agree as to calyx-lobes and grow in the same region *M. grandis* may represent only a large-flowered state of *M. franciscana*, but more material is needed to prove or disprove this possibility.

Myosotis lutea (Cav.) Pers., var. **versicolor** (Pers.), comb. nov. *M. arvensis* (L.) Hill, var. ? *versicolor* Pers. Syn. i. 156 (1805). *M. versicolor* (Pers.) Sm. in Sowerby's Engl. Bot. xxxvi. sub t. 2558 (1814).

Anchusa lutea Cav. Icones i. 50, t. 69, fig. 1 (1791) is the earliest designation for this rather variable but unique species. That Cavenilles' plant is merely the form of the species with corollas remaining yellow (the common state has corollas yellow in anthesis but soon changing to bright- and then to rose-blue, i. e. the var. *versicolor*) is shown by the adoption of the name *M. lutea* for this species in the authoritative work, Flora der Schweiz by Schinz und Keller, 3 Auflage, I Teil 440 (1909). Hermann, in his carefully prepared Flora von Deutschland und Fennoskandinavien 384 (1912) also takes up Cavenilles' name. It seems to me however that this noticeable phenomenon of the color-change that takes place in the corolla after anthesis is important enough to justify varietal designation of these plants in which it occurs, especially since they are of more frequent occurrence than those with corollas yellow even in age.

Onosmodium. Mr. Mackenzie, in his discriminating revision of this group as it occurs north of Mexico, endeavored to define the genus so as to exclude from it the large-flowered section *Macromerioides* Gray (Syn. Fl. ii. pt. I. 205), and proposed for *O. Thurberi* Gray the new combination *Macromeria Thurberi* (Gray) Mackenzie, Bull. Torr. Club xxxii. 496 (1905). In regard to this transfer of *O. Thurberi* he wrote: "It seems certainly congeneric with *M. viridiflora* DC., *M. cinerascens* DC. and *M. discolor* Benth. Whether these species are congeneric with the original species of Don [*M. exserta*] I cannot determine at present, the material I have seen being too scanty." Examination of a number of good collections of *M. exserta* has disclosed the fact that the nutlets are always keeled ventrally. In all other species the nutlets are not at all keeled. Accordingly *M. exserta*, since it possesses this distinctive character of fruit in addition to the great development of corolla with flaring lobes and long-exserted stamens, can scarcely be considered congeneric with *O. Thurberi* and its rela-

tives, a group characterized by not at all carinate nutlets, included or slightly exserted stamens and erect or suberect corolla-lobes. This group, section *Macromerioides* Gray, is possible of two interpretations. It may be regarded either as a subgenus of *Onosmodium* or as a genus intermediate to *Onosmodium* and *Macromeria*. Mackenzie, in writing of *O. Thurberi* stated, l. c., " It differs from *Onosmodium* in the greatly elongated corolla, exserted stamens, long filaments and versatile anthers, in usually ripening more nutlets, and in the persistence of the enlarged base of the style." However, upon examination of all the species of both sections, *Onosmodium* proper and *Macromerioides*, it seems to me clear that none of these characters are appropriate for the definition of genera because they exist in variable and inconstant degrees of development, even for example, the apparently distinctive character, " anthers versatile." As a matter of fact the anthers are quite as versatile in *O. occidentalis* as in *O. Thurberi*; in neither are they truly versatile or truly innate being attached above the base toward, but not at, the middle. Gray, l. c., indicated that the anthers of *O. Thurberi* were not truly versatile as in the related Mexican species but this fact did not deter Mackenzie from transfering *O. Thurberi* to the genus containing these species. That it would be unwise to try to maintain this section as a genus distinct from *Onosmodium* proper becomes even more evident when the species *O. strigosum* G. Don is taken into consideration. This plant " looks " like a narrow-leaved *O. Thurberi* with corollas only about half as long. But the stamens are included and moreover the anthers are woolly dorsally. Altogether it seems advisable to regard these large-flowered species as congeneric with the smaller-flowered group *Onosmodium* proper, allowing *Macromeria* to stand as a monotypic genus, distinguished principally by the keeled nutlets. It becomes necessary, in accordance with this viewpoint of the generic limitation of *Macromeria* to transfer a few species described under that genus to *Onosmodium*. Since three of these are represented in this herbarium I am making this number of the required new combinations.

Onosmodium discolor (Benth.), comb. nov. *Macromeria discolor* Benth. Pl. Hartw. 49 (1840).

Onosmodium Pringlei (Greenm.), comb. nov. *Macromeria Pringlei* Greenm. Proc. Am. Acad. xxxiv. 570 (1899).

Onosmodium longiflorum (D. Don), comb. nov. *Macromeria longiflora* D. Don, Edinb. N. Phil. Journ. xiii. 239 (1832).

Onosmodium longiflorum (D. Don) Macbr., var. **hispidum** (Mart. & Gal.), comb. nov. *Macromeria hispida* Mart. & Gal. Bull. Acad. Brux. xi. pt. 2, 339 (1844). *M. longiflora* D. Don, var. *hispida* (Mart. & Gal.) A. DC. Prod. x. 68 (1846).

Onosmodium unicum, spec. nov., ut videtur 4–5 dm. altum; caule ad apicem ramoso pilis adpresse crispeque et cum nonnullis pilis longioribus firmiusculis intermixtis; foliis radicalibus ignotis caulinis oblongo-lanceolatis basi et apice acutis circa 5 cm. longis 1.5–1.8 cm. latis supra viridibus parce papilloso-hispidis et minute strigillosis subtus pallidioribus 3–5 nerviis strigillosis et imprimis veniis adpresse hispidis, foliis superioribus gradatim reductis; racemis subviscoso-strigosis et -hispidis; corolla circa 12 mm. longa, tubo (ut videtur flavo) extus parce villoso, intus glabro; lobis (ut videtur viridibus) corollae anguste ovato-acuminatis ad apicem plus minusve recurvatis extus adpresse strigosis fere 4 mm. longis; antheris 2.5 mm. longis apiculatis; stylo exserto; calycis lobis inaequalibus fere linearibus circa 8 mm. longis; nuculis acute fere rotundis circa 4 mm. longis nitidis laevissimis. — Mexico: Alvarez, San Luis Potosi, July 13–23, 1904, *Palmer*, no. 185 (Type, Gray Herb.).

This very unique species is related to the Texan *O. bejariense* DC. which has extremely hispid stems and calyces, the long hairs widely spreading, and is not at all viscid.

Onosmodium revolutum (Robinson), comb. nov. *Lithospermum revolutum* Robinson, Proc. Am. Acad. xxvii. 182 (1892).

This very distinctive plant is a better *Onosmodium* it seems to me than a *Lithospermum*. Since the discovery of the Mexican species *L. Palmeri* and *L. oblongifolium*, both with the aspect of *Onosmodium* and with nearly the corolla of that genus, the difficulty of defining in good contrast these genera has been greatly increased. The above species, which may be said to be on the border-line between the genera possess, however, very rounded corolla-lobes which are somewhat spreading. This character is peculiar to *Lithospermum*. But the corolla of *L. revolutum* has erect lobes that are acute or at least acutish and moreover the limb is entirely without appendages of any sort; they are usually present in some degree in *Lithospermum*. *L. strictum* Lehm. (under which name *L. revolutum* was first distributed) is aberrant in *Lithospermum* because it has the tubular corolla of *Onosmodium*

with suberect lobes. The lobes, however, are rounded, the throat of the corolla is appendaged and the aspect of the plant is more suggestive of *Lithospermum* than of *Onosmodium*. But *L. revolutum* has the aspect of *Onosmodium*, which fact, taken together with its corolla-characters seems to justify its classification as a member of that genus rather than of *Lithospermum*.

Macromeria exserta D. Don, var **imparata,** var. nov., caulibus adpresse strigillosis; pilis haud patentibus; aliter formae typicae simillima. — Mexico: Oaxaca, 1842, *Ghiesbreght* (Type, Gray Herb.).

This variety is not furnished with the rigid widely spreading hairs which are so abundant on the stems of the typical form of the species with which it otherwise agrees.

Lithospermum chersinum, spec. nov., ut videtur herbaceum 7.5 dm. altum (Langlassé in schedulis); caulibus superne 2–3-chotomis adpresse strigillosis et hispidis; foliis caulinis superioribus ovato-lanceolatis acuminatis basi abrupte acutis 4-6 cm. longis 1–1.5 cm. latis mediocriter conspicue pinnativeniis subadpresse papilloso-hispidis subtus inter nervos subvillosis canescentibus et parce hispidis imprimis in nervos; racemis elongatis; pedicellis fructiferis incurvatis circa 5 mm. longis et calycis laciniis 10 mm. longis linearibus hispidis et strigosis; corolla alba circa 15 mm. longa, tubo circa 12 mm. longo extus et intus adpresse piloso et faucibus glandulari-granulosis; limbi lobis rotundatis minute crenulatis; nuculis laevissimis haud punctatis. — Mexico: Cerro Verde, near the boundary between Michoacan and Guerrero, Nov. 6, 1898, *Langlassé*, no. 581 (Type, Gray Herb.); hills, Uruapan, Michoacan, Nov. 15, 1905, *Pringle*, no. 13761.

This species is apparently related to *L. Nelsonii* Greenm. but the resemblance is mostly one of aspect rather than of agreement in technical characters. The presence of pubescence within the corolla tube, the absence of appendages in the throat and the crenulate corolla lobes are a few of the distinctive features of *L. chersinum.*

III. NOTES ON THE HYDROPHYLLACEAE AND A FEW OTHER NORTH AMERICAN SPERMATOPHYTES

a. Hydrophyllaceae

Hydrophyllum Fendleri (Gray) Heller, var. **albifrons** (Heller), comb. nov. *H. albifrons* Heller, Bull. Torr. Club xxv. 267 (1898).

Brand, Pflanzenreich iv. 251. 33 (1913), retains *H. albifrons*, evidently unaware that *H. occidentale* Gray, var. *Fendleri* Gray, which he treats as a variety of *H. albifrons* Heller, was raised to the rank of species in Plant World i. 23 (1897), a year before the publication of the latter name. Brand's disposition of the plants represented by the above names may well be followed so it becomes necessary to make the new combination indicated. The variety, then, represents the more western state of the species which has the pedicels generally longer than the sepals. *H. capitatum* Dougl. has an analogous variation in the variety *alpinum* Wats.

Phacelia laxa Small, Bull. Torr. Club xxv. 141 (1898). This species has an exact synonym in *P. prostrata* Brand, Pflanzenreich iv. 251. 68 (1913). Brand failed to include *P. laxa* in his revision, l. c., of *Phacelia*.

Phacelia madrensis Greenm. Proc. Am. Acad. xxxix. 85 (1903). *P. rupicola* Robinson & Fernald, var. *madrensis* (Greenm.) Brand, Pflanzenreich iv. 251. 67 (1913).

Brand, l. c., observes "Planta teste auctore perennis. Stylum non inveni divisum 'nearly to the base,' sed paulo infra medium partitum." The type preserved in the Gray Herbarium shows that the plant is undoubtedly perennial and the style *is* divided "nearly to the base" so this latter character must vary in different individuals. Further collections are needed before it will be possible to pass on the constancy of the characters upon which Greenman, l. c., founded his species. Brand describes *P. rupicola* as "Annua (?)." It is clearly, as first described, a perennial.

Phacelia minor (Harvey), comb. nov. *Whitlavia minor* Harvey, Hook. Journ. Bot. v. 312 (1846). *Phacelia Whitlavia* Gray, Proc. Am. Acad. x. 322 (1875), in part. *P. Whitlavia* Gray, forma *minor* (Harvey) Brand, Pflanzenreich iv. 251. 71 (1913).

Phacelia minor (Harvey) Macbr., var. **Whitlavia** (Gray), comb. nov. *P. Whitlavia* Gray, Proc. Am. Acad. x. 322 (1875), in part. *P. Whitlavia* Gray, forma *genuina* Brand and var. *Jonesii* Brand, l. c., *Whitlavia grandiflora* Harvey, l. c., not *Phacelia grandiflora* (Benth.) Gray, l. c. 321.

It is indeed unfortunate that the "California Blue Bell," one of the largest flowered Phacelias, should have to be designated, for reasons of priority, *P. minor*. The species occurs in two forms which differ only in the size of the corolla and Harvey gave the name *minor* to the plant with corollas 2 cm. or less long in contrast to his *Whitlavia grandiflora* which sometimes has flowers 4 cm. long. The type of the large-flowered plant has the stamens but slightly exserted but these organs vary greatly in this respect, sometimes being distinctly exserted, again quite included. Since Dr. Gray used Harvey's generic name specifically in large part to represent *W. grandiflora* and since florists know the plant simply as "Whitlavia" it may well be retained as the formal variety *Whitlavia*. Several lovely color-forms exist in horticulture.

Phacelia Bakeri (Brand), comb. nov. *P. crenulata* Torr., var. *Bakeri* Brand, Pflanzenreich iv. 251. 78 (1913). *P. glandulosa* Nutt., var. *australis* Brand, l. c. 83 and var. *deserta* Brand, l. c., in part. — Southwestern Montana to Nevada and Colorado. — Montana: Bannock City, July 19, 1880, *Watson*, no. 281. Idaho: rock slides, Salmon River near Clayton, July 22, 1916, *Macbride & Payson*, no. 3364. Nevada: Mt. Grant, Mineral Co., July 2, 1913, *Heller*, no. 10900. Utah: Wasatch Mts., Aug., 1883, *Jones* (R. Mt. Herb.). Colorado: Ouray, Aug. 10, 1901, *Baker*, no. 758; Cumbres, Sept. 7, *Baker*, no. 549; head of Rio Grande, Sept., 1875, *Brandegee*.

This distinctive plant, the basis of two new varieties by Brand under different species, is nearest in fruit-characters to *P. glandulosa* Nutt. Brand's interpretation of Nuttall's species is atrocious. Besides *P. Bakeri* (as var. *australis*) he includes in it Nelson's no. 8053 as var. *elatior* Brand which variety excellently represents the totally different *P. neomexicana* Thurber, var. *alba* (Rydb.) Brand! And his var. *deserta* is *P. Bakeri* except as to Nelson's no. 3050, the type of *P. deserta* A. Nels. and this is true *P. glandulosa* Nutt., apparently the only typical material of *P. glandulosa* seen by Brand.

Phacelia integrifolia Torr., var. **robusta,** var. nov., planta robusta 4–12 dm. alta; caulibus ad medium 1 cm. latis; foliis caulinis superioribus ovato-rotundatis saepius 10 cm. longis 6 cm. latis. — Texas: Chinati Mts., 1882, *Havard*, no. 250 (Type, Gray Herb.).

Only the upper portion of the plant is shown but the label bears the note "2–3 ft. high." It was evidently a much larger plant than is usual for *P. integrifolia* in which species Dr. Gray included it. The leaves of the latter, however, are usually of an oblong rather than oval type.

Phacelia crenulata Torr., var. **ambigua** (Jones), comb. nov. *P. ambigua* Jones, Contrib. W. Bot. xii. 52 (1908). *P. crenulata* Torr., var. *vulgaris* Brand, Pflanzenreich iv. 251. 78 (1913) as to some specimens.

The setose-hispid character of the pubescence on the stem distinguishes the variety *ambigua*. The variety merges with the typical form but it is often well-marked and moreover almost if not entirely replaces in Arizona true *P. crenulata*.

Phacelia congesta Hook., var. **rupestris** (Greene), comb. nov. *P. rupestris* Greene, Leaflets i. 152 (1905); Brand, Pflanzenreich iv. 251. 85 (1913); Wooten & Standley, Contrib. U. S. Nat. Herb. xix. 533 (1915).

Hooker, l. c., drew his description from plants collected by Drummond in the vicinity of Galveston, Texas, and specimens closely agreeing with the original diagnosis have been secured since only from the southern and eastern portions of the state. These are characterized by ample merely downy leaves and corollas about 5 mm. long. Collections from farther north and west, however, exhibit great variation in the size of the leaves and the character of the pubescence. The leaves are generally smaller and the pubescence is often more pronounced on both leaves and stems. In New Mexico and far-western Texas there occurs a variation in which these tendencies culminate in extreme form to produce a plant with velvety leaves and more or less hispid stems. This state has received the name *P. rupestris* and Brand included the plant it represents in *P. congesta*. Wooten & Standley, l. c., however, retained Greene's name and thus excluded *P. congesta* from the flora of New Mexico. In this they were surely justified in so far as true *P. congesta* is concerned but examination of material from

southwestern Texas and northern Mexico must show the inadvisability of regarding the New Mexican material as representing a distinct species because collections exist which are so intermediate in character between it and the typical state that they directly connect the two. However the western plants are in general easily distinguished and therefore I propose for them the above varietal designation.

Phacelia Anelsonii, spec. nov., annua erecta stricta mediocriter robusta glanduloso-viscida circa 3 dm. alta; foliis late oblongis valde sinuato-crenatis vel subpinnatifidis raro lyratis lobis crenulatis circa 6 cm. longis 1–2 cm. latis viridibus sed parce glanduloso-viscidis; racemis paniculatis laxiusculis; calycis lobis late ovatis obtusis glanduloso-hirsutis circa 4 mm. longis fere 2 mm. latis; corolla circa 6 mm. longa rotato-campanulata laete violacea; staminibus styloque semibifido inclusis; seminibus faveolatis haud corrugatis. — NEVADA: rich soil under cliffs, Meadow Valley Wash, April 28, 1902, *Goodding*, no. 635 (TYPE, R. Mt. Herb.).

This is the plant which Goodding, when he described his *P. foetida*, Bot. Gaz. xxxvii. 58 (1904), took to represent *P. Palmeri* Wats., a very different plant with exserted stamens and corrugated seeds. *P. Anelsonii* resembles *P. crenulata* Torr. in leaves, *P. integrifolia* Torr. in habit and seeds. It is unique, however, among species of this alliance in the included stamens. In this one character it suggests the obviously distinct *P. coerulea* Greene and *P. invenusta* Gray, species with corrugated seeds and very different aspect. Aven Nelson has been the sponsor of many trips for botanical exploration one of which may be appropriately commemorated by dedicating to him this distinctive plant.

Phacelia cinerea Eastw., in herb., *P. distans* paraffinis sed perennis et griseo-pubescens ubique superne viscida et glandulosa; cymis brevibus circa 2.5 cm. longis 3–5 radiatis, racemis fructiferis densifloris; floribus ut apud *P. distans*; calycis lobis oblongo-lanceolatis spathulatisve circa 4 mm. longis capsula ellipsoidea vix duplo longioribus. — CALIFORNIA: moist flats, San Nicolas Island, April, 1901, *Blanche Trask* (TYPE, Gray Herb.).

This plant is a rather remarkable addition to the group of characteristic species which include *P. distans* and *P. ramosissima*. The cinereous pubescence of *P. cinerea* is distinctive but the foliage and flowers (especially the nature of the corolla-appendages) simulate closely *P. distans*. The latter plant, however, is consis-

tently annual or possibly biennial in duration. *P. cinerea* is as obviously perennial as the otherwise different *P. ramosissima*. Miss Eastwood has kindly given me permission to publish for her this species to which she assigned the name *P. cinerea* when studying at the Gray Herbarium.

PHACELIA DISTANS Benth., var. AUSTRALIS Brand, Univ. Cal. Publ. Bot. iv. 216 (1912); Pflanzenreich iv. 251. 89 (1913). *P. distans* Benth., var. *eu-distans* Brand, subvar. *ammophila* (Greene) Brand, l. c.

This plant, in common with many others that have a range which extends from north-central to extreme-southern California occurs in two forms, one, confined largely to the coastal region and characterized by very unequal obovate sepals and the other, largely belonging to the interior valleys, characterized by less unequal linear-lanceolate or narrowly oblanceolate sepals. In general distinct enough these forms merge, especially in the central part of the state where specimens have been secured which are so intermediate in character that they directly connect the typical or coastal form of the species and the variety *australis*, i. e. the form of the interior with relatively narrow sepals. The type of *P. distans* came from Bodega Point and two leaf forms grow in that vicinity, one having simply pinnatifid leaves and one bipinnatifid. Brand in his revision described the former leaf-form as variety *australis* but based it on specimens from interior southern California, evidently having seen only the typical form from the type locality. It is impossible, however, to distinguish satisfactorily in this group of species varieties based only on degree of leaf-division because the variation in this respect is so great. On the other hand it is entirely practicable and also desirable to indicate by name the calyx-variation discussed above because its occurrence is correlated with a range-difference that is noteworthy. Accordingly it seems to me that the proper treatment of the variety *australis* Brand is to interpret it to include the plant of the interior of the state irrespective of the relative deepness to which the leaflets are cut since this obviously superficial variation belongs equally to the typical form of the coast. In accord with this view the var. *ammophila* (Greene) Brand becomes a synonym of the var. *australis* Brand.

PHACELIA HISPIDA Gray, Syn. Fl. ii. pt. I. 161 (1878). Brand's treatment of this species is not satisfactory, largely because he failed to interpret correctly the typical form. *P. hispida* was based on specimens with leaflets very similar to those of *P. ramosissima*, to which species, indeed, Gray, Proc. Am. Acad. x. 319 (1875), at first allied it. Brand establishes two subvarieties of his variety *genuina*. One of these, at least in large part, represents true *hispida*. And he distinguishes subvar. *cicutaria* from subvar. *heterosepala* merely by the acute lobes of the leaflets at the same time remarking "kaum zu unterscheiden." As a matter of fact *P. heterosepala* Greene, upon which Brand bases his subvariety, is an ally of *P. platyloba* Gray and consequently has nothing to do with *P. hispida*. Because of this general misinterpretation of the variants of this species it appears advisable to give the following synopsis which includes two varieties not before published. It seems superfluous to remark that these variations merge. Their instability of character, however, does not mean that in general they are not readily recognizable. Accordingly it is satisfactory to give them a place in classification.

Leaflets ovate-lanceolate, especially the terminal one . . . . . *P. hispida.*
Leaflets oblong or oblong-lanceolate.
  Calyces and stems strongly hispid with long white hairs; fruiting racemes moderately open, at least at base.
    Stems simple or the branches strongly ascending; flowers white or yellowish . . . . . var. *cicutaria.*
    Stems branched, the branches widely spreading; flowers pale purple . . . . . var. *heliophila.*
  Calyces and upper portions of stems shaggy-hirsute; fruiting racemes very dense, even at base . . . . . var. *Hubbyi.*

P. HISPIDA Gray, var. GENUINA Brand, Univ. Cal. Publ. Bot. iv. 214 (1912). *P. eximia* Eastw. Bull. Torr. Club xxxii. 204 (1905). *P. hispida* Gray, subvar. *cicutaria* (Greene) Brand, l. c. 215, in part. — Tulare and San Luis Obispo Counties to San Bernardino and San Diego Counties. — Three Rivers, May 15, 1894, *Eastwood*; Huasna, June 13, 1902, *Eastwood*; Santa Barbara Co., 1865, *Torrey*, no. 351; Sulphur Mts., June, 1908, *Abrams & MacGregor*, no. 51; Los Angeles, *Nevin*, no. 7; Witchcreek, June, 1894, *Alderson*; San Diego, 1875, *Cleveland*; Pomona, May 6, 1904, *Baker*, no. 4749; San Bernardino, June 3, 1895, *Parish*, no. 3670; Claremont, Los Angeles Co., June 24, 1904, *Baker*, no. 4776; San Bernardino, 1880, *Vasey*, no. 421.

var. **cicutaria** (Greene), comb. nov. *P. cicutaria* Greene, Pitt. v. 20 (1902). *P. hispida* Gray, subvar. *cicutaria* (Greene) Brand,

Univ. Cal. Publ. Bot. iv. 215 (1912); subvar. *heterosepala* Brand, except as to Austin specimen which is *P. heterosepala* Greene! — California, in the interior from Butte to San Bernardino Counties; also Utah. — UTAH: Diamond Valley, May 16, 1902, *Goodding*, no. 823. CALIFORNIA: Oroville, April 5, 1913, *Heller*, no. 10709; Cold Cañon, Butte Co., June, 1879, *Mrs. R. M. Austin*; Eldorado Co., April 6, 1911, *Heller*, no. 12283; Polasky, Madera Co., April 11, 1906, *Heller*, no. 8146; Red Hill, Inyo Co., May 14, 1906, *Heller*, no. 8255; Caliente, Kern Co., April 7, 1905, *Heller*, no. 7611.

var. **heliophila,** var nov., divergenti-ramosa; corolla magna, purpurea. — CALIFORNIA: gravelly open slopes, growing in clumps, Sunset, Kern Co., April 20, 1905, *Heller*, no. 7730 (TYPE, Gray Herb.).

var. **Hubbyi,** var. nov., annua, superne dense hirsuto-hispida; racemis densissimis, pedicellis fructiferis fere erectis. — CALIFORNIA: Ojai Valley, May 20, 1896, *Frank W. Hubby*, no. 31 (TYPE, Gray Herb.); also nos. 35, 36; Santa Clara River, Ventura Co., May, 1885, *Gray*; 1884, *Nevin*, no. 8.

The hirsute rather than hispid inflorescence with suberect pedicels suggests strongly *P. tanacetifolia*. Brand has written on the herbarium sheet of Mr. Hubby's no. 35 " this is nothing else than the genuine form of *P. hispida!*" a statement which serves to emphasize his misinterpretation of that species. Mr. Hubby called attention in a letter to the annual duration of his plant (forbidding its reference to *P. ramosissima*) and to its apparent relation to *P. hispida* which he could not call it however because of the " much softer hairiness."

PHACELIA UMBROSA Greene, Eryth. ii. 191 (1894). *P. hispida* Gray, var. *umbrosa* (Greene) Brand, Pflanzenreich iv. 251. 88 (1913); var. *brachyantha* Coville, Contrib. U. S. Nat. Herb. iv. 158 (1893). *P. cryptantha* Greene, Pitt. v. 21 (1902).

This plant seems to be distinguishable constantly from *P. hispida* by its very small flowers. Brand maintains the varieties cited on the degree of dilation of the sepals at apex. I fail to see even a varietal distinction in this variation.

PHACELIA RAMOSISSIMA Dougl. ex Lehm. Pug. ii. 21 (1830). Examination of the ample material in the Gray Herbarium of this widely distributed perennial has disclosed the fact that several noteworthy variations of the typical form of the species occur and that these variations are correlated with rather definite range-isolations. The clearest and simplest expression of this phenomenon may be had by the employment of a key to the several

variations and by the citation of specimens illustrative of their respective ranges.

Stems glandular-hirsute and hispid or in var. *subsinuata* with broadly obovate sepals, merely hispid.
Sepals gradually narrowed at base, oblanceolate or broader but mostly distant . . . . . *P. ramosissima.*
Sepals abruptly narrowed to a claw-like base, obovate and closely approximate.
Stems glandular-hirsute as well as hispid . . . . . var. *suffrutescens.*
Stems essentially smooth except for a more or less dense hispid pubescence . . . . . var. *subsinuata.*
Stems glabrous or merely puberulent, rarely very sparsely hispid; sepals narrow and distant . . . . . var. *eremophila.*

P. RAMOSISSIMA Dougl. ex Lehm. Pug. ii. 21 (1830). *P. decumbens* Greene, Pitt. v. 17 (1902). *P. ramosissima* Dougl., forma *decumbens* (Greene) Brand, Univ. Cal. Publ. Bot. iv. 215 (1912). — Washington to Lake County, northern California. — CALIFORNIA: Little Shasta River July 6, 1876, *Greene*, no. 896; Big Chico Creek, Butte Co., July 2, 1914, *Heller*, no. 11517; Yreka, June 28, 1876, *Greene*, no. 896; Kelseyville, July, 1885, *Brandegee*. WASHINGTON: Douglas Co., June 22, 1893, *Sandberg & Leiberg*, no. 288; Soap Lake, Grant Co., June 28, 1902, *MacKay*, no. 1; Priest Rapids, Columbia River, July, 1883, *Brandegee*, no. 975.

var. SUFFRUTESCENS Parry ex Gray, Syn. Fl. ii. pt. I. 416 (1886). *P. ramosissima* Dougl., forma *suffrutescens* (Parry) Brand, Pflanzenreich iv. 251. 92 (1913). *P. bifurca* Greene, Pitt. v. 18 (1902). *P. fastigiata* Greene, l. c. *P. polystachya* Greene, l. c. 19. — California, from Kern to San Diego County. — Antelope Valley, Los Angeles Co., July, 1884, *Oliver*; San Bernardino, May 15, 1897, *Parish*, no. 4392; Claremont, Aug. 2, 1903, *Baker*, no. 3661; San Diego, May, 1852, *Thurber*, no. 580; Los Angeles, 1882, 1884, *Nevin*; Wilson Peak, June 9, 1895, *Davidson*, no. 4; 1876, *Parry & Lemmon*, no. 262; Witch Creek, June 20, 1903, *Abrams*, no. 3781; 1881, *Parry*, no. 200; Fort Tejon, Kern Co., July 2, 1891, *Coville & Funston*, no. 1154.

var. **subsinuata** (Greene), comb. nov. *P. subsinuata* Greene, Pitt. v. 19 (1902). *P. ramosissima* Dougl., forma *suffrutescens* (Parry) Brand, in part. — Monterey to San Diego Co., usually near the coast. — CALIFORNIA: Del Monte Station, June 19, 1903, *Heller*, no. 6852; also Sept., 1902, *Elmer*, no. 4071; Santa Barbara, Aug. 21, 1904, *Abrams*, no. 4117; also June, 1875, *Rothrock*, nos. 44, 95, 112; Ellwood, May 19, 1908, *Eastwood*, no. 188; Zaca Mt., June, 1902, *Eastwood*; Sulphur Mts., June, 1908, *Abrams & MacGregor*, no. 7; Eaton Cañon, Los Angeles Co., June, 1887, *Lyon*, no. 2; Newport Bay, Orange Co., *Nevin*; Playa del Rey, Los Angeles Co., June 9, 1902, *Abrams*, no. 2497; Witch Creek, July 11, 1912, *Abrams*, no. 4911.

var. **eremophila** (Greene), comb. nov. *P. eremophila* Greene, Pitt. v. 20 (1902). *P. ramosissima* Dougl., forma *decumbens* (Greene) Brand, in part. — Central Sierra Nevada of California to western Idaho and Washington. — IDAHO: Quartzburg, July 25, 1892, *Mulford*. NEVADA: Hunter Creek Canyon, Washoe Co., Aug. 15, 1908, *Dinsmore*, no. 1788; Verdi, July 24, 1912, *Heller*, no. 10605; Humboldt Canyon, Humboldt Co., July 31, 1912, *Heller*, no. 10624; Carson City, 1865, *Anderson*, no. 198; King's Cañon, Ormsby Co., June 30, 1902, *Baker*, no. 1198; also Eagle Valley, no. 1091; East Humboldt Mts., Aug., 1865, *Watson*, no. 874; Jarbidge, Elko Co., July 10, 1912, *Nelson & Macbride*, no. 2010; also Gold Creek, no. 2127. CALIFORNIA: Sierra Co., 1874, *Lemmon*; Yosemite Valley, July 6, 1911, *Abrams*, no. 4644; Summit Pass, Eldorado Co., Aug. 4, 1915, *Heller*, no. 12136; Donner Pass, Nevada Co., July 27, 1903, *Heller*, no. 7032; 1869, *Bolander*, no. 4910. WASHINGTON: Desert Well, south of Big Springs, July 5, 1894, *Leiberg*, no. 390.

PHACELIA THERMALIS Greene, Eryth. iii. 66 (1895). *P. firmomarginata* A. Nels. Bot. Gaz. liv. 143 (1912) is to be included in this species. The range of *P. thermalis* is thus extended from eastern Oregon to southwestern Idaho. The small flowers and short style distinguish it at once from the otherwise similar *P. ciliata* Benth. of California.

PHACELIA MAGELLANICA (Lam.) Cov., Contrib. U. S. Nat. Herb. iv. 159 (1893). The plant to which this specific name was first given was collected at the Straits of Magellan before the close of the eighteenth century. It was destined to remain in obscurity, however, until 1893 when Coville, l. c., called attention to the fact that the *Hydrophyllum magellanicum* of South America was a species of Phacelia very closely related if not identical to *P. leucophylla* Torr., a well-known and widely distributed plant of the Rocky Mountains. Several "floras" purporting to "cover" territory, at least a portion of which is within the range of Torrey's species, have appeared since Coville launched his suggestion, but the authors of these books have continued to maintain *P. leucophylla* and the closely allied *P. heterophylla*. It would appear therefore that American botanists have either ignored Coville's theory or have regarded the South American plant as specifically distinct from the North American, a position which has been rigorously challenged by Brand in his recent revision of the genus. American systematists have generally regarded the group to which

P. leucophylla belongs as consisting of about half a dozen closely related and variable but usually readily definable species, notably, besides Torrey's species, *P. heterophylla*, *P. nemoralis* and *P. californica*. In vivid contrast to this interpretation of the group stands Brand's treatment which consists in the recognition of one species (*P. magellanica*). Twenty-three variants of this species are deemed worthy of names and are tabulated as "formas," no fewer than sixteen of which are confined to North America. It is my candid opinion that Brand's method of dealing with this complex group has been quite wrong. For instance, the relative importance of the numerous components of the group is lost sight of because each variant is regarded as a "form" of *P. magellanica*, regardless whether it differs from the typical state merely in the obviously superficial difference of stature or in some more fundamental way, as in the quality of pubescence, or the development of the calyx. Again, Brand has buried with this loss of all indication of the natural relationships within the group, nearly or quite all those niceties of range-distinctions which, interesting in themselves, often mean so much in the intelligent understanding of taxonomic units. In short, whatever truth Brand may have won from nature in regard to this group of variable plants, he has failed to represent because of his method of classification, — an inutile method that leads nowhere since it is not subservient to a fundamental purpose of taxonomy. It is peculiarly unfortunate that the treatment of this group is so unsatisfactory since, because of its complexity and the great variability of the plants that compose it, it has been in greatest need of revision. Accordingly it has seemed desirable to prepare the following arrangement, which, whatever its defects may be, ameliorates, it is felt, the nearly chaotic condition in which the group was left by Brand.

Key to the Species and Varieties of the P. magellanica

Group of Euphacelia

a. Basal leaves densely rosulate; plants usually more or less cinereous with an appressed or in part spreading pubescence *b.*

b. Stamens well-exserted; filaments long-pubescent (except in *P. dasyphylla*); corolla 5–10 mm. long *c.*

c. Leaves entire (basal auriculate in var. *compacta*); sericeous with a closely appressed pubescence *d.*

d. Leaves all entire.
Fruiting calyx hispid, the hairs in part subappressed ..... 1. *P. leucophylla.*
Fruiting calyx inordinately setose-hispid with widely spreading hairs ..... 1a. var. *Suksdorfii.*
d. Leaves, at least the basal, auriculate-pinnatifid 1b. var. *compacta.*
c. Leaves, at least some of the basal, pinnate or auriculate-pinnate, or rarely entire but pubescence not at all appressed-sericeous *e.*
e. Calyx not accrescent in fruit; biennials or rather short-lived perennials *f.*
f. Filaments distinctly bearded; leaves very rarely all entire.
Racemes forming a long virgate inflorescence; biennial ..... 2. *P. heterophylla.*
Racemes not virgately disposed; usually short-lived perennial ..... 2a. var. *griseophylla.*
f. Filaments nearly glabrous; leaves entire ..... 3. *P. dasyphylla.*
e. Calyx always more or less distinctly accrescent in fruit; mostly perennials confined to California 4. *P. californica.*
b. Stamens barely exserted or rarely exceeding by 3 mm. the small (4–6 mm. long) corolla; filaments glabrous ..... 5. *P. magellanica.*
a. Basal leaves not at all rosulate; bristly hispid but green-foliaged plants *g.*
g. Basal leaves mostly pinnatifid; Mexican and South American species.
Filaments densely pubescent ..... 6. *P. pinnata.*
Filaments glabrous or nearly so ..... 6a. var. *robusta.*
g. Basal leaves mostly entire; North American species.
Sepals ovate-lanceolate ..... 7. *P. nemoralis.*
Sepals linear or linear-lanceolate ..... 7a. var. *mutabilis.*

1. P. LEUCOPHYLLA Torr. in Fremont's Rep. 93 (1845). *P. magellanica* (Lam.) Cov., f. *leucophylla* (Torr.) Brand, Pflanzenreich iv. 251. 98 (1913); f. *angustifolia* Brand, l. c. *P. Burkei* Rydb. Bull. Torr. Club xxxvi. 675 (1909). *P. leptosepala* Rydb. l. c. 676. — Alberta to Colorado and Inyo County, California, north to British Columbia. — ALBERTA: Crow Nest Pass, Aug., 1897, *Macoun*, no. 23777. MONTANA: Spanish Basin, Gallatin Co., June 24, 1897, *Rydberg & Bessey*, nos. 4852, 4853. IDAHO: Idaho Falls, July 4, 1901, *Merrill & Wilcox*, no. 779; also St. Anthony, no. 826; New Plymouth, June 4, 1910, *Macbride*, no. 186; also Boise-Payette Project, no. 877; Wiessner's Peak, July 25, 1895, *Leiberg*, no. 1357; Snake country, *Burke*; King Hill, July 15, 1911, *Nelson & Macbride*, no. 1084; Silver City, July 19, 1910, *Macbride*, no. 428; Trinity, Elmore Co., Aug. 9, 1910, *Macbride*, mo. 561; Boise, May 29, 1911, *Clark*, no. 45; also June 18, 1910, *Macbride*, no. 256; Henry's Lake, Sept. 1, 1899, *A. & E. Nelson*, no. 6801. WYOMING: Natrona Co., July 8 and Big Horn Co., July 19, 1901, *Goodding*, nos. 223, 313; Mammoth Hot Springs, June 30, 1899, *A. & E. Nelson*, no. 5600; Teton Pass, July 13, 1901, *Merrill & Wilcox*, no. 985. COLORADO: 1862, *Hall*

& Harbour, no. 439; Trail Glen, July 22, 1901, *Clements*, no. 54; Horsetooth Mt., June 18, 1896, *Cowen*, no. 1609. UTAH: Peterson, July, 1902, *Pammel & Blackwood*, no. 3891; Kimballs, June 3, 1908, *Mrs. Joseph Clemens*. NEVADA: Blaine, Elko Co., Aug. 22, 1913, *Heller*, no. 11110. CALIFORNIA: Mancoba Cañon, Inyo Mts., July 2, 1891, *Coville & Funston*, no. 1798; along railroad, Gazelle, Siskiyou Co., June 20, 1905, *Heller*, no. 8080 ("perhaps introduced"). OREGON: Swan Lake Valley, Klamath Co., June 28, 1895, *Applegate*, no. 366; Stein Mts., July 9, 1896, *Leiberg*, no. 2532; waste places, Arlington, Aug. 26, 1903, *C. D. Meel*. WASHINGTON: Sprague, June 7, 1893, *Sandberg & Leiberg*, no. 171; Rockland, June 3, 1905, *Suksdorf*, no. 5045; Rattlesnake Mts., June 5, 1901, *Cotton*, no. 475. BRITISH COLUMBIA: Lardo, June 16, 1905, *Shaw*, no. 695.

1a. f. **alpina** (Rydb.), comb. nov. *P. alpina* Rydb. Mem. N. Y. Bot. Gard. i. 324 (1900). *P. heterophylla*, var. *alpina* (Rydb.) A. Nels. in Coulter & Nelson New Man. R. Mt. Bot. 408 (1909). *P. magellanica* (Lam.) Cov., f. *alpina* (Rydb.) Brand, Univ. Cal. Publ. Bot. iv. 217 (1912); also f. *compacta* Brand, l. c., in part. *P. nervosa* Rydb. Bull. Torr. Club xxxvi. 675 (1909). — Merely the reduced alpine state with the range of the typical form of the species. — WYOMING: Leigh's Lake, Teton Mts., July 26, 1901, *Merrill & Wilcox*, no. 1048. MONTANA: Bridge's Pass, *Engelmann*. NEVADA: Mt. Rose, Washoe Co., Aug. 26, 1911, *Heller*, no. 10216. CALIFORNIA: Marble Mt., Siskiyou Co., June, 1901, *Chandler*, no. 1655. OREGON: Blue Mts., 1880, *Cusick*, no. 894. WASHINGTON: Bretton Springs, July 2, 1894, *Leiberg*, no. 383.

1b. var. **Suksdorfii,** var. nov., calycis fructiferi laciniis valde setoso-hispidis cum pilis patentibus. — WASHINGTON: Sandy bottom-land near Bingen, Klickitat Co., Aug. 15 and Sept. 5, 1895, *Suksdorf*, no. 3647 (TYPE, Gray Herb.).

1c. var. **compacta** (Greene), comb. nov. *P. compacta* Greene ex Brand, Univ. Cal. Publ. Bot. iv. 217 (1912). *P. magellanica* (Lam.) Cov., f. *compacta* (Greene) Brand, l. c. — Western Nevada and adjacent California: — NEVADA: Spooner, Douglas Co., June 23, 1902, *Baker*, no. 1142. CALIFORNIA: Yosemite, June 6, 1897, *Congdon*, no. 35.

2. P. HETEROPHYLLA Pursh, Fl. Am. Sept. i. 140 (1814). *P. magellanica* (Lam.) Cov., f. *heterophylla* (Pursh) Brand, Univ. Cal. Publ. Bot. iv. 218 (1912). *P. virgata* Greene, Eryth. iv. 54 (1896). *P. magellanica* (Lam.) Cov., f. *virgata* (Greene) Brand, l. c. 219. — Montana to Nevada and northern California to southeastern Washington. — MONTANA: Ravalli, July 15, 1908, *Mrs. Joseph Clemens*. IDAHO: Hatwai Creek, May 14, 1892, *Sandberg, MacDougal & Heller*, no. 174; Forks of St. Mary's River, July 3, 1895, *Leiberg*, no. 1159; Silver City, July 14, 1910, *Macbride*, no. 377; Deadwood Creek, Owyhee Co., July 1, 1912, *Nelson & Macbride*,

no. 1848. NEVADA: King's Cañon, Ormsby Co., June 10, 1902, *Baker* no. 1040; Carson City, 1865, *Anderson*. CALIFORNIA: Yreka, Siskiyou Co., June 7, 1876, *Greene*, no. 832. OREGON: Waldo, June, 1884, *Howell*, no. 211; Andrews, Stein Mts., July 10, 1896, *Leiberg*, no. 2548; Hay Creek, Crook Co., June 12, 1894, *Leiberg*, no. 208. WASHINGTON: Waitsburg, May 18, 1897, *Horner*, no. B352.

f. **frigida** (Greene), comb. nov. *P. frigida* Greene, Pitt. iv. 39 (1899). *P. magellanica* (Lam.) Cov., f. *frigida* (Greene) Brand, Univ. Cal. Publ. Bot. iv. 218 (1912). — Reduced alpine form; California to Oregon. — CALIFORNIA: Mt. Eddy, *Copeland*, no. 3831; Mt. Shasta, Aug. 16, 1903, *Eastwood*, no. 3920. OREGON: Mt. Hood, Aug. 25, 1899, *Barber*, no. 213; also Aug. 1, 1886, *Howell*, no. 198.

2b. var. **griseophylla** (Brand), comb. nov. *P. magellanica* (Lam.) Cov., f. *griseophylla* Brand, Univ. Cal. Publ. Bot. iv. 218 (1912); f. *heterophylla* (Pursh) Brand, l. c., in part. — Montana to New Mexico, Utah and California, north to Washington. — MONTANA: Spanish Basin, June 26, 1897, *Rydberg & Bessey*, no. 4850. IDAHO: Tamarack, Washington Co., Aug. 4, 1911, *Clark*, no. 184; Pinehurst, Boise Co., Aug. 17, 1911, *Macbride*, no. 1661. COLORADO: Mancos Cañon, July 3, 1898, *Baker, Earle & Tracy*, no. 308; Pagosa Springs, July, 1899, *Baker*, no. 548; also above Cimarron, no. 401; Routt Co., July 18, 1903, *Goodding*, no. 1592; Paradox, July 11, 1912, *Walker*, no. 231. UTAH: Juab, June 9, 1902, *Goodding*, no. 1065; below Silver Lake, July 4, 1905, *Rydberg & Carlton*, no. 6636. NEW MEXICO: White Mts., Aug. 6, 1897, *Wooton*, no. 291; Winsor's Ranch, July 3, 1908, *Standley*, no. 4140. ARIZONA: Black River, *Goodding*, no. 547; Metcalf, 1900, *Davidson*, no. 504a. CALIFORNIA: Red Clover Valley, Plumas Co., July 6, 1907, *Heller & Kennedy*, no. 8755; Shasta Co., June 24, 1916, *Heller*, no. 12445. OREGON: Dalles, April 11, 1903, *Lunell*, no. 39; Pilot Butte, Crook Co., July 3, 1905, *E. Nelson*, no. 852. WASHINGTON: 1889, *Vasey*, no. 412. BRITISH COLUMBIA: Chilliwack Valley, 1901, *Macoun*, no. 54327.

3. P. DASYPHYLLA Greene ex Brand, Pflanzenreich iv. 251. 97 (1913), in syn. — CALIFORNIA: Mt. Whitney, Aug. 15, 1904, *Culbertson*, no. 4355.

4. P. CALIFORNICA Cham. Linnaea iv. 494 (1829). *P. magellanica* (Lam.) Cov., f. *californica* (Cham.) Brand, Univ. Cal. Publ. Bot. iv. 218 (1912). — Vicinity of San Francisco, California. — Near San Francisco, May 3, 1903, *Baker*, no. 2841; San Bruno Hills, *Baker*, no. 1901 and *Heller*, no. 8460; Mt. Tamalpais, *Heller*, no. 8405; Lake Merced, *Heller*, no. 5701; Crystal Springs, San Mateo Co., *Baker*, no. 690; Mission Hills, Marin Co., 1891, *Michener & Bioletti*, no. 99; Napa Valley, March, 1852, *Thurber*; Bodega Point, June 29, 1915, *Eastwood*, no. 4841.

4a. var. IMBRICATA (Greene) Jepson, Fl. Middle Cal. 439 (1901). *P. imbricata* Greene, Eryth. i. 127 (1893). *P. circinata* (Willd.) Jacq., var. *calycosa* Gray, Proc. Am. Acad. x. 317 (1875). *P. imbricata* Greene, var. *condensata* Brand and var. *caudata* Brand, Univ. Cal. Publ. Bot. iv. 220 (1912). *P. stimulans* Eastw. Proc. Cal. Acad. Sci. ser. 3, ii. 291 (1902). *P. virgata* Greene, var. *ampliata* Greene, Eryth. iv. 55 (1896). — Butte to San Luis Obispo and Tulare Counties; also the Yosemite. — CALIFORNIA: Butte Co., June 6, 1913, *Heller*, no. 10786; Lake Co., June 7, 1916, *Heller*, no. 12374; St. Helena, May 2, 1897, *Jepson*; also April, 1903, *Baker*, nos. 2601, 2604; Vacaville, Solano Co., 1902, *Heller & Brown*, no. 5408; Los Gatos, May 14, 1904, *Heller*, no. 7415; Cholame, San Luis Obispo Co., June, 1887, *Lemmon*, no. 4609; Yosemite, 1872, *Gray*; Kaweah River, Tulare Co., June 5, 1904, *Culbertson*, no. 4200; Cache Creek, Yolo Co., May 8, 1903, *Baker*, no. 2980.

P. californica is rather constant in character in central California but is extremely variable where it occurs to the north and south of the range of the typical form. These variations have been treated by Brand as forms of *P. magellanica* and it seems worth while to maintain them. They grade insensibly into each other, however, and connect *P. californica*, var. *imbricata* with *P. heterophylla* through the forma *vinctens*.

KEY TO THE FORMS OF P. CALIFORNICA

Sepals ovate, obtuse or acutish; stems 3 dm. or more high; perennial ..... 4b. f. *bernardina*.

Sepals lanceolate to linear-lanceolate very acute, or if ovate and obtusish stems much less than 3 dm. high.
- Subalpine perennial of southern California ..... 4c. f. *Ballii*.
- Biennials or perennials of low altitudes in central and northern California.
  - Perennial; inflorescence not virgate ..... 4d. f. *egena*.
  - Biennial; inflorescence virgate or the racemes elongate .... 4e. f. *vinctens*.

4b. f. **bernardina** (Greene), comb. nov. *P. virgata* Greene, var. *bernardina* Greene, Eryth. iv. 55 (1896). *P. magellanica* (Lam.) Cov., f. *bernardina* (Greene) Brand, Univ. Cal. Publ. Bot. iv. 218 (1912). — Southern and Lower California. — CALIFORNIA: Sulphur Mts., June 1–2, 1908, *Abrams & McGregor*, no. 50; San Bernardino, May 6, 1896, *Parish*, no. 4150; Julian, June 21, 1903, *Abrams*, no. 3794; Erskin Creek, 1897, *Purpus*, no. 5108. MEXICO: Palm Valley, Lower California, 1883, *Orcutt*.

4c. f. **Ballii** (Brand), comb. nov. *P. magellanica* (Lam.) Cov., f. *Ballii* Brand, Pflanzenreich iv. 251. 99 (1913); f. *patula* Brand,

Univ. Cal. Publ. Bot. iv. 219 (1912). — Southern California. — Mt. Wilson, June 29, 1902, *Abrams*, no. 2591; Topatopa Mts., 1908, *Abrams & McGregor*, no. 77; Cuyamaca Mts., 1897, *Parish*, no. 4423; Pah-Ute Peak, 1879, *Purpus*, no. 5548.

4d. f. **egena** (Greene), comb. nov. *P. egena* Greene, ex Brand, Univ. Cal. Publ. Bot. iv. 218 (1912). *P. magellanica* (Lam.) Cov., f. *egena* (Greene) Brand, l. c. — Siskiyou to Tulare Counties, California. — Yreka, June 8, 1905, *Heller*, no. 7993; Marysville Buttes, Sutter Co., May 17, 1902, *Heller & Brown*, no. 5565; Oroville, Butte Co., April 3, 1914, *Heller*, no. 11257; Mariposa, May, 1897, *Congdon*, no. 36; Yosemite, June 20, 1911, *Abrams*, no. 4428; Kaweah River, Tulare Co., July 21, 1904, *Culbertson*, no. 4415.

4e. f. **vinctens,** f. nov., biennis; racemis saepius elongatis, erectis. — *P. magellanica* (Lam.) Cov., f. *virgata* (Greene) Brand, Univ. Cal. Publ. Bot. iv. 219 (1912), in part, not *P. virgata* Greene. — Northern California. — Sisson, Siskiyou Co., June 23, 1916, *Heller*, no. 12422; Chico Meadows, July 23, 1914, *Heller*, no. 11600; Glenn Co., July 8, 1914, *Heller*, no. 11550; Genessee, Plumas Co., July 15, 1907, *Heller & Kennedy*, no. 8852; Donner Lake, Nevada Co., July 8, 1903, *Heller*, no. 6883 (Type, Gray Herb.).

5. P. MAGELLANICA (Lam.) Cov., Contrib., U. S. Nat. Herb. iv. 159 (1893). *Heliotropium pinnatum* Vahl. Symb. Bot. iii. 21 (1794). — Western South America from Peru to Patagonia.

6. **P. pinnata** (R. & P.), comb. nov. *Aldea pinnata* R. & P. Fl. Peruv. ii. 8, t. 114 (1799). *P. circinnata* (Willd.) Jacq. f. Eclog. i. 135 (1816). *P. magellanica* (Lam.) Cov., f. *vulgaris* Walpers ex Brand, Pflanzenreich iv. 251. 99 (1913); f. *pinnata* Brand, l. c. — Mexico and western South America. — Mexico: Ixtaccihuatl, Oct., 1905, *Purpus*, no. 1766; southwestern Chihuahua, 1885, *Palmer*, no. 389.

6a. var. **robusta** (Brand), comb. nov. *P. magellanica* (Lam.) Cov., f. *robusta* Brand, Pflanzenreich iv. 251. 97 (1913); f. *amoena* Brand, l. c., in part. — Range of the typical form. — Mexico: Cerro San Felipe, Oaxaca, 1894, *E. W. Nelson*, no. 1086; Sierra Madre, Aug. 20, 1898, *E. W. Nelson*, no. 4811. South America: Cochabamba, Bolivia, 1891, *Bang*, no. 1040; La Paz, Bolivia, May, 1887, *Mandon*, no. 377; Sorata, Bolivia, Feb., 1886, *Rusby*, no. 1157.

7. P. NEMORALIS Greene, Pitt. i. 141 (1887). — Vicinity of San Francisco. — California: Smith Creek, Santa Clara Co., May 30, 1907, *Heller*, no. 8586; also Los Gatos, no. 7450; Oakland, *Jones*, no. 159; Forest Grove, June 3, 1896, *Jepson*; Berkeley Hills, May 19, 1910, *Walker*, no. 1995.

7a. var. **mutabilis** (Greene), comb. nov. *P. mutabilis* Greene, Eryth. iv. 55 (1896). — Western Washington and south through the interior of California to New Mexico. — New Mexico: Saw-

yers Peak, Grant Co., Sept. 30, 1904, *Metcalfe*, no. 1398. ARIZONA: Rincon Mts., Sept. 14, 1909, *Blumer*, no. 3357; Chiricahua Mts., Oct., 1906, *Blumer*, nos. 1471, 1474. CALIFORNIA: Summit, Placer Co., July 16, 1909, *Heller*, no. 9861; Siskiyou Co., and Eldorado Co., 1915, *Heller*, nos. 12231, 12168; Scott Mts., Aug. 22, 1876, *Greene*, no. 1032; Amador Co., 1895, *Hansen*, no. 1129; Mammoth, Mono Co., July 22, 1891, *Coville & Funston*, no. 1824. OREGON: Crater Lake, Aug. 30, 1916, *Heller*, no. 12596. WASHINGTON: Montesano, June 10, 1898, *Heller*, no. 3923; Mount Paddo, Sept. 22, 1911, *Suksdorf*, no. 7377.

PHACELIA HUMILIS T. & G., var. **Congdoni** (Greene), comb. nov. *P. Congdoni* Greene, Pitt. v. 22 (1902).

Until the capsule is broken and about half a dozen seeds roll out no one would have any hesitancy in referring Greene's plant to *P. humilis*. The latter species, however, develops normally only four seeds. In view of the fact that other species of the section *Euphacelia* occasionally develop more seeds than usual, it seems sensible to regard *P. Congdoni* as representing such a condition in the case of *P. humilis*, especially since it apparently possesses no other points of difference. In this connection it seems worth while to quote Brand's opinion in regard to *P. malvifolia*, var. *loasifolia* (Benth.) Brand, since the relation of this species and its variety is analogous to that of *P. humilis* and its variety. "Diese Form [*loasifolia*] wurde bisher wegen der grösseren Anzahl der Ovula zur Sektion *Eutoca* gestellt. Sie stimmt aber in allen anderen Beziehungen so völlig mit *P. malvifolia* überein, dass sie meiner Ansicht nach nicht von dieser Art getrennt werden kann."

Phacelia minima, spec. nov., planta minutissima 3–4 cm. alta ubique glanduloso-hirsuta; caulibus filiformibus; foliis oppositis ovato-lanceolatis basi in petiolum attenuatis circa 1 cm. longis 3–5 mm. latis; floribus 1–5; pedicellis filiformibus circa 5 mm. longis; calycis lobis linearibus vel anguste oblanceolatis 3–4 mm. longis; corolla ut videtur alba calycem paullo superante; filamentis glabris inclusis; stylo fere bipartito circa 2 mm. longo; capsula fere globosa 2–4-sperma, sepalis paullo brevior. — CALIFORNIA: Lake Tenaya, Mariposa Co., Aug. 18, 1890, *Congdon* (TYPE, Gray Herb.).

P. minima is a delicate little annual referable — because of the few-seeded capsule — to the section *Euphacelia*. Its characters suggest a rather close relationship to *P. Eisenii* but the few long-pedicelled flowers, included stamens and opposite leaves preclude

referring it to that species. Even if one ignores the few seeds and compares *P. minima* with species of the section *Eutoca* — a few known to vary in the number of seeds developed — it becomes evident there is no species of that section which simulates our species at all closely.

Phacelia mollis, spec. nov., biennis vel perennis mediocriter robusta stricta circa 4 dm. alta; caulibus ubique molliter villosis haud glandulosis; foliis radicalibus longo-petiolatis (petiolis circa 6 cm. longis) grosse dentatis vel lobatis, lobis integerrimis, laminis late oblongis 5–10 cm. longis 2–4 cm. latis supra viridibus sed adpresse hirsutulis et glandulari-granulosis subtus dense villosis; foliis caulinis similibus sed brevioribus; thyrsis circa 1 dm. longis valde villosis aliquid lutescentibus; pedicellis fructiferis 3–4 mm. longis et calycis laciniis 8–10 mm. longis linearibus vel linearilanceolatis acutis; corolla coerulea circa 9 mm. longa calycem superante circa 4 mm.; staminibus styloque (apice bifido) corollam multo superantibus; capsula 8–9 mm. longa cuspidatis, pluriovulatis. — YUKON: Coffee Creek, Yukon River, July 9, 1914, *Eastwood,* no. 551a (TYPE, Gray Herb.).

P. mollis is apparently unique among known species of this genus. The numerous seeds and the general aspect suggest a possible relationship to *P. sericea* and *P. Franklinii,* species from which it is readily separated by its foliage and unusual pubescence.

Phacelia marcescens Eastw., in herb., annua mediocriter diffuse ramosa circa 2.5 dm. alta; caulibus strigillosis et parce hispidis et plus minusve glandulosis; foliis adpresse strigillosis, caulinis inferioribus petiolatis ovato-lanceolatis nunc grossedentatis nunc pinnatifidis; superioribus integerrimis; racemis numerosis breviter pedunculatis demum circa 5 cm. longis densifloris; pedicellis fructiferis calyce brevioribus; calycis lobis linearibus vel anguste oblanceolatis subaequalibus breve hirsutis; corolla circa 5 mm. longa; filamentis glabris exsertis; stylo solum apice bifido circa 1 mm. longo; capsula ovoidea, corolla marcescente coronata, calyce fructifero vix aucto paullo brevior; capsula solum 2–4-sperma. — CALIFORNIA: Bear Valley, Nevada Co., 1872, *Bolander* (TYPE, Gray Herb.).

This plant, in spite of the fact that the capsules contain only 2–4 seeds, probably belongs in the section *Eutoca* rather than in *Euphacelia.* The former section already contains species which have, at least at times, few seeded capsules, as *P. Purpusii* and *P. Pringlei.* The remarkable characteristic of *P. marcescens* is the persistent corolla, a peculiarity hitherto known to only three

species, *P. sericea*, *P. lenta*, and *P. saxicola*, and these are all members of the section *Eutoca*. *P. saxicola* Gray is the only one of these species that approaches at all closely *P. marcescens* and it may be distinguished at once by its included stamens and minute corolla. Miss Eastwood, when studying at the Gray Herbarium, wrote on the sheet of the type "*P. marcescens*, n. sp." She has kindly given me permission to publish it for her.

Phacelia verna Howell, Eryth. iii. 35 (1895). Brand reduces this species to *P. Pringlei* Gray. He observes, that it is a "forma placentis pluriovulatis." However, this is not the only difference; the merely hirsutulous calyx-lobes of *P. Pringlei* are only slightly longer than the globose capsule. In *P. verna* they are hispid-ciliate and much longer than the oblong-ovoid capsule. The latter species is not uncommon in southwestern Oregon where it apparently entirely replaces *P. Pringlei* of northern California. The species are closely related, it is true, but until intergrades are found they may be considered specifically distinct.

Phacelia minutissima Henderson, Bull. Torr. Club xxvii. 351 (1900). To the synonomy of this species must be added *P. foliosepala* Nels. & Macbr. Bot. Gaz. lv. 377 (1913). The really diagnostic character of this plant is the very short style, scarcely 1 mm. long. The species is known now from two localities; Blaine Co., Idaho, and Elko Co., Nevada.

Phacelia Ivesiana Torr., var. **glandulifera** (Piper) Nels. & Macbr., in herb. *P. glandulifera* Piper, Contrib. U. S. Nat. Herb. xi. 472 (1906). *P. Ivesiana* Torr., f. *glandulifera* (Piper) Brand, Pflanzenreich iv. 251. 126 (1913). *P. luteopurpurea* A. Nels. Bot. Gaz. lii. 271 (1911).

The variety — distinguished by the more glandular pubescence and the larger corolla — apparently replaces entirely in Washington, Oregon, and Idaho the typical form. The latter ranges from Wyoming to California and in Utah meets and merges with the variety. Because of the general distinctness of the two variants, however, both seem to us worthy of recognition, but since they pass into each other where their ranges meet the later published form may become a variety of the state first recognized.

Phacelia bicolor Torr., var. **Leibergii** (Brand) Nels. & Macbr., in herb. *P. Leibergii* Brand, Pflanzenreich iv. 251. 128 (1913).

Except for the fact that the corolla-appendages are connate with the filaments only at base rather than for nearly or quite their entire length, *P. Leibergii* cannot be distinguished from *P. bicolor*. Since the degree to which the appendages are connate with the filaments is, in itself, a variable character, *P. Leibergii* can scarcely be considered as representing more than an extreme condition of this kind.

Phacelia Howellii, spec. nov., annua simplex 4–5 cm. alta; caulibus breviter hirsutis parce glandulosis foliosissimis; foliis integerrimis utrinque adpresse sericeo-hirsutis subtus valde venosis radicalibus fere rotundatis circa 5 mm. longis, caulinis inferioribus oppositis petiolatis ovatis vel ovato-lanceolatis 1–2 cm. longis, 5–8 cm. latis; superioribus similibus sed sessilibus; racemis terminalibus demum circa 2 cm. longis densifloris; pedicellis fructiferis calyce brevioribus; calycis lobis mediocriter hispidis haud glandulosis linearibus vel oblongo-lanceolatis subaequalibus capsula ovoidea paullo longioribus; corolla glabris ut videtur alba circa 5 mm. longa; filamentis glabris inclusis; stylo semibifido ciliato fere 3 mm. longo; placentis 3–4-ovulatis. — Oregon: *Joseph Howell and Thomas Howell*, no. 369 (Type, Gray Herb.).

This little species is labeled by Dr. Gray "*P. divaricata*, var. Depauperate." However, the glabrous filaments and corolla distinguish it at once. I do not find that it is closely related to any described species.

Miltitzia inyoensis, spec. nov., tenella, erecta vel suberecta, pube minuta vix glandulosa; foliis fere oblongis inciso-pinnatifidis dentatisve; racemis laxifloris; pedicellis fructiferis circa 3 mm. longis et calycis laciniis 6 mm. longis; corolla laete lutea minima sed sepala superante; stylo ovario multo breviore; seminibus valde corrugatis solum 1 mm. longis. — California: foothills west of Bishop, Inyo Co., May 23, 1906, *Heller*, no. 8324 (Type, Gray Herb.).

This species is nearest *M. foliosa*, an inhabitant of saline places in northern Utah and Wyoming. Its corolla scarcely equals the calyx, the seeds are 2 mm. or more long and the stems are subdecumbent. *M. inyoensis*, on the other hand, is essentially erect in habit, the corolla slightly exceeds the calyx and the mature seeds are barely 1 mm. long. Furthermore, it grows, according to the collector, "in a small dry peat bog among the granite sands," a habitat very different from that of *M. foliosa*.

Wigandia caracasana HBK., var. **viscosa** (Donn. Sm.), comb. nov. *W. caracasana* HBK., forma *viscosa* Donn. Sm. Enum. Pl. Guatemal. iv. 107 (1895); Brand, Pflanzenreich iv. 251. 137 (1913). *W. Kunthii* Choisy, var. *viscosa* (Donn. Sm.) Brand, l. c.

The typical form of this plant seems to be confined to extreme northern South America. The above variety differs in no way except in its much greater viscosity. It is the most common form in Mexico where two other variants occur, the variety *calycina* Brand, which is similar to the variety *viscosa* except for the elongate sepals, and the variety *macrophylla* (C. & S.) Brand characterized by the very sericeous scarcely at all glandular inflorescence. The latter variety has the long sepals of the variety *calycina*. Brand maintains *W. Kunthii* Choisy as distinct from *W. caracasana* HBK. on its greater style-length. This is a phenomenon which is evidently an individual variation and of no value for the discrimination of species. The best means of distinction between these species is the setose-hispid inflorescence of *W. Kunthii*, the character emphasized by Choisy. The species apparently merge but on the whole may be distinguished readily.

Turricula, gen. nov. Capsula submembranacea ovoideo-globosa longitudine fere calycis. Semina brunneo-nigra, perlucentia, angulata, minutissime rugosis per longitudinem et transverse. Calyx 5-partitus ad basin. Corolla infundibuliformi-tubiformis. Stamina nuda inclusa inaequalia, basi anguste alata cum tubo corollae coalita. Styli duo calyce longiores, corolla breviores, inferne barbati. — Herbae perennes, magnae, simplex, saepius 18 dm. altae. Folia alterna, angusta, dentato-undulata. Flores sessiles in thyrso longo terminali deposito.

Turricula Parryi (Gray), comb. nov. *Nama Parryi* Gray in Brewer & Wats. Bot. Cal. i. 621 (1876). *Eriodictyon Parryi* (Gray) Greene, Pitt. ii. 22 (1889).

The proper disposition of this plant has long been a subject of controversy. Greene in transferring *N. Parryi* to *Eriodictyon*, l. c., wrote: "If this plant ought to be a *Nama* the whole genus *Eriodictyon* should go with it." Brand, however, in his recent treatment of the *Hydrophyllaceae*, Pflanzenreich iv. 251. 160 (1913) retains the species in *Nama* without comment. But the discriminating student of California botany, Dr. Hall, has accepted Greene's viewpoint in regarding *N. Parryi* as an *Eriodictyon*, cf. Univ. Cal. Publ. Bot. i. 106 (1902), and more recently Abrams and

Smiley in their altogether admirable revision of *Eriodictyon* in Bot. Gaz. lx. 115–133 (1915) have omitted *N. Parryi* from their treatment but have referred to it as follows: "*Nama Parryi* Gray agrees with typical *Eriodictyon* in seed character and essentially in fruit and perhaps should be placed here rather than in *Nama*, but it is an ill-scented herbaceous perennial of a totally different habit from true *Eriodictyon* and at least worthy of subgeneric distinction." It appears then that this plant is a misfit in either *Nama* or *Eriodictyon* and it seems to me that it is far preferable to consider it as representing a monotypic genus distinct from both genera. Moreover, notwithstanding the fact that the unique aspect is the most obvious argument against referring the plant to either *Nama* or *Eriodictyon*, technical and slight but constant differences are not lacking. *Turricula* differs from *Nama* in the presence of longitudinal striations on the seeds and in the undulate-dentate leaves and from *Eriodictyon* (to which genus, as shown above, Greene, Hall, and Abrams and Smiley either refer it or ally it) in the herbaceous stem, the submembranaceous capsule and the naked stamens. Finally, in the case of *Eriodictyon* particularly, the inclusion there of *T. Parryi* destroys the now perfect homogeneity of that group.

NAMA HUMIFUSUM Brand, Beiträge Hydrophyll. 9 (1911). Dr. Gray included in his species (based originally upon northern Mexican material) specimens from California and it did not occur to any one that these represented a species distinct from the type of *N. stenocarpum* until Brand proposed for them the name *N. humifusum*. Brand stated that the unequal stamens of *N. stenocarpum* are unappendaged; that those of *N. humifusum* are equal and appendaged at base. These points of difference are minute but at first glance apparently of specific value. Upon investigation, however, it is seen that Brand has in part mistaken and in part misconstrued the facts in the case. In the first place the stamens are somewhat unequal in both Mexican and Californian material including that by Dr. Hasse, the original collection of *N. humifusum*. Secondly the stamens in reality are appendaged in both forms, the apparently unappendaged condition of *N. stenocarpum* being due to the fact that the filaments are attached to the corolla as far as the appendage extends which in turn is not free even at the tip. The adnate portion of the filament, therefore,

appears to be narrowly wing-margined. These wing-like appendages are not noticeable until one inserts a dissecting needle and raises them from the corolla-tube-surface. The appendages of *N. humifusum* are simply a modification of the above phenomenon but here the tips of the appendages are free and extend above the adnate portion of the filaments so that the appendages are obvious as such. The truth would thus seem to be represented better by the following contrasting statements.

Appendages appearing as narrow wing-margins to the adnate portions of the filament.....*N. stenocarpum.*
Appendages free for about one-third their length.....*N. humifusum.*

Since the Californian and Mexican specimens exhibit no other differences and since even this very obscure difference is virtually a variation of a single character it seems to me problematical whether the northern plants are specifically distinct from the Mexican.

Nama stenophyllum Gray, var. **egenum,** var. nov., adpresse strigosum haud villoso-hirsutum. — Texas: bluffs of Delaware Creek, Guadalupe Mts., 1882, *Havard*, no. 15 (Type, Gray Herb.). Mexico: San Lorenzo and Parras, Coahuila, 1880, *Palmer*, no. 862.

The typical form, represented by Palmer's no. 861, is villous-hirsute with spreading hairs. Dr. Gray mentioned the fact that a form existed in which the spreading pubescence is wanting [cf. Hemsley Bot. Biol. Centr.-Amer. ii. 361 (1882)]. This variation is so striking that it seems to me worthy varietal recognition.

Nama rotundifolium (Gray), comb. nov. *N. rupicolum* Bonpl., var. *rotundifolium* Gray in Hemsl. Bot. Biol. Centr.-Amer. ii. 363 (1882). *N. origanifolium* HBK., subsp. *rupicolum* (Bonpl.) Brand, var. *rotundifolium* (Gray) Brand, Pflanzenreich iv. 251, 150 (1913).

The long silky villous pubescence and extremely elongate pedicels of *N. rotundifolium* are features in strong contrast to the short, dense, in part felt-like pubescence and short pedicels of both *N. rupicolum* and *N. origanifolium.* Besides, neither of these species has been found farther north than the southern portion of San Luis Potosi. *N. rotundifolium* is known only from Coahuila and Nuevo Leon. Bilimek no. 392 from Puebla, referred here by Brand, is genuine *N. rupicolum.* It is worthy of note that Brand saw no specimen of *N. rotundifolium.*

NAMA ORIGANIFOLIUM HBK. In spite of the fact that Wooton & Standley in Contrib. U. S. Nat. Herb. xvi. 163 (1913) state that their *Marilaunidium xylopodum* "does not seem to be closely related to any of the perennial species" I am unable to separate it satisfactorily from *Nama origanifolium*. Havard's specimen from the Guadalupe Mts. of far-western Texas upon which Wooton & Standley base their species agrees excellently with the detailed description and plate of HBK's species in their Nov. Gen. & Spec. iii. 130, t. 218 (1818). The Mexican material I have seen of *N. origanifolium* is less strongly hispid than the Texan plant but the difference in this respect is very slight and in all probability represents merely an individual variation.

NAMA DICHOTOMUM (Ruiz & Pavon) Choisy, var. ANGUSTIFOLIUM Gray. *Marilaunidium tenue* Wooton & Standley, Contrib. U. S. Nat. Herb. xvi. 162 (1913) is not to be distinguished. The characters which the authors give as a means of distinguishing their plant are valueless as they exist in every degree in the var. *angustifolium*.

NAMA DICHOTOMUM (Ruiz & Pavon) Choisy, var. **pueblense** (Robinson & Greenman), comb. nov. *N. pueblense* Robinson & Greenman, Proc. Am. Acad. xxxii. 39 (1896).

Brand, Pflanzenreich iv. 251. 150 (1913), reduced *N. pueblense* outright to true *N. dichotomum*. It appears, however, to merit varietal recognition. The seemingly thinner leaves are somewhat broader more distinctly contracted to a petiolar base and usually more evenly pubescent on both surfaces. The hispid pubescence of the lower leaf-surfaces of the typical form is confined largely to the veins while it is evenly distributed over the upper surface. Furthermore the vars. *pueblense* and *angustifolium* entirely replace true *N. dichotomum* north of South America.

ROMANZOFFIA SUKSDORFII Greene, Pitt. v. 38 (1902). *R. californica* Greene, l. c. 39. *R. mendocina* and *R. spergulina* Greene, l. c. 40, 41. *R. sitchensis* Bong., var. *grandiflora* Heague & Schmidt, subvar. *Greenei* Brand, f. *Suksdorfii* (Greene), Brand, Pflanzenreich iv. 251. 171 (1913).

This seems to be a good species constantly distinct from *R. sitchensis* by virtue of the long corolla and bulbous base. Brand, l. c., maintained *R. californica* but misinterpreted *R. Suksdorfii*. The type of the latter is more pubescent than the Californian

plants described by Greene as *R. californica* but *R. sitchensis* displays similar variation in the degree of hairiness. *R. Suksdorfii* quite replaces *R. sitchensis* in California and is much the more common in Oregon.

HYDROLEA OVATA Nutt. Harper has collected this species in southwestern Georgia thereby extending its range eastward from Louisiana. Brand, Pflanzenreich iv. 251. 179 (1913), distinguished the Georgian plant from the typical form as var. *georgiana*, characterized by the glabrous upper portions of the calyx. Unfortunately, however, Harper's no. 1170 (the type no. of var. *georgiana*) as represented in the Gray Herbarium has the calyx quite as uniformly pubescent as in specimens from the region of the lower Mississippi and in no way is distinguishable.

HYDROLEA AFFINIS Gray, Man. ed. 5, 370 (1867). Brand, Pflanzenreich iv. 251. 184 (1913), credits this species with densely pubescent sepals when as a matter of fact they are entirely glabrous. Gray, l. c., laid emphasis upon this character, his description reading " glabrous throughout " and, in a note, " distinguished [from *H. quadrivalvis*] by the smoothness and the broader sepals." Brand's misinterpretation of *H. affinis* led him to write in regard to it and *H. quadrivalvis*: " Der vorigen Art sehr ähnlich und oft mit ihr verwechselt, aber geographisch streng geschieden." As a matter of fact the species are definitely and consistently distinct as pointed out by Gray in 1867 (not " 1872 " as given by Brand).

HYDROLEA MEGAPOTAMICA Sprengel, var. **paraguayensis** (Chodat), comb. nov. *H. paraguayensis* Chodat, Bull. Herb. Boiss. vii. app. i. 78 (1899).

This variety differs from the typical state only in the presence of spines. *H. spinosa* L., var. *inermis* Spruce represents a similar variation and it seems to me possible that the presence or absence of spines may be a Mendelian trait. *H. megapotamica* is regarded by Brand as the spineless condition of *H. spinosa* and he unnecessarily makes the new combination *H. spinosa* L., var. *megapotamica* (Sprengel) Brand when this variety is already furnished with a name, i. e. var. *inermis* Spruce. It is obvious however both from the original characterization and from Bennett's treatment that Sprengel's plant from southern Brazil and Chodat's from adjacent Paraguay are the same and nicely distinct from *H.*

spinosa by the large flowers and less viscid pubescence. The complete synonymy of this tropical species is as follows:

HYDROLEA MEGAPOTAMICA Sprengl., Syst. iv. Cur. poster. 114 (1827); Bennett, Journ. Linn. Soc. xi. 273 (1869), not *H. spinosa* L., var. *megapotamica* Brand, Pflanzenreich iv. 251. 182 (1913) which = *H. spinosa* L., var. *inermis* Spruce ex Bennett, l. c. 269. *H. paraguayensis* Chodat, var. *inermis* Chodat, Bull. Herb. Boiss. ser. 2. iv. 64 (1904).

HYDROLEA ALBIFLORA (Chodat & Hassler) Brand, Pflanzenreich iv. 251. 182 (1913). *H. glabra* Schum., var. *spinosa* Chodat & Hassler, and forma *albiflora* Chodat & Hassler, Bull, Herb. Boiss. ser. 2. iv. 64 (1904).

This seems to be a good species. But the parenthetical authority is not " Hassler " as given by Brand, l. c., but "Chodat & Hassler" as is quite evident from the original publication. Possibly it is hypercritical to call attention to errors of this kind — especially since there are few if any who do not at times make similar mistakes — but in a work which is so comprehensive and imposing as the " Pflanzenreich " one is certainly justified in expecting a minimum of errors of this nature. Unfortunately these are so numerous that it becomes necessary to verify every reference as given by Brand.

b. OTHER NORTH AMERICAN SPERMATOPHYTES

TOFIELDIA INTERMEDIA Rydb. Bull. Torr. Club xxvii. 528 (1900). The salient character of this species does not appear to have been brought out; certainly it was not indicated in the original publication and the inclusion of the species by Piper and Beattie in their recently published " Flora of the Northwest Coast " when it does not occur in the region their book purports to cover, would seem to furnish further proof that the species is not understood. Rydberg, l. c., segregated his species from *T. glutinosa* of the eastern United States on the shorter raceme, and the broader and somewhat longer sepals and petals. These are characters which are certainly not specific because they exist in varying degree in both eastern and western specimens. Collections of *T. glutinosa*, especially from the region of the Great Lakes, often have distinctly obovate sepals and short racemes. Nevertheless these are referable to *T. glutinosa* because they have the seeds of that species and the only reliable

criterion by which to distinguish species in this genus is found in the character of the seeds. This character was made use of by Watson, Proc. Am. Acad. xiv. 283 (1879), in his revision of *Tofieldia*. His description of the seeds of *T. glutinosa*, "Minute, with close brownish testa, and a contorted tail at each end" and of *T. occidentalis* "angular-ovate, with loose white spongy testa, and a slender tail at the outer end nearly as long as the body" is, in each case, accurate, and it is surprising that the variable and indistinct character of the degree in which the bractlets are connate should have been used in place of the definite seed-characters as a means of distinction. Yet this character of the bractlets is used by Rydberg, l. c., as the principal difference between *T. occidentalis* and *T. intermedia*, i. e., *T. glutinosa* as to western specimens. In reality *T. intermedia* has nearly the seeds of *T. glutinosa* (but as I shall show they are not exactly the same) but not at all the seeds of *T. occidentalis*, which species is confined in the Northwest to western Washington, Vancouver Island and southern British Columbia but extends south to northern California, the type locality. *T. intermedia*, on the other hand, ranges from northwestern Wyoming to Montana, eastern Washington and Alaska, and may be distinguished constantly from *T. glutinosa*, which occurs as far west as Banff, Alberta, only by the different seeds. These are similar in shape to those of *T. glutinosa* but are inclosed in a close-fitting thin net-like white testa suggesting that of *T. occidentalis* but not spongy and loose about the seed. In general the sepals of *T. intermedia* are, as Rydberg indicated, broader than those of *T. glutinosa* but the strength of the species really lies in the difference in seed-coat. *T. occidentalis* is even more distinctive since its seed-coat is so unusual and since it is normally a much more robust, taller plant than either of the more eastern species. Watson based this latter species on a nearly mature specimen from northern California which shows most of the bractlets connate only at base. Material from the same region, however, which is in blossom, often has the bractlets quite as connate as in *T. intermedia*, and considerable variation in this respect is not infrequently observable in a single specimen.

✓ THYSANOCARPUS CURVIPES Hook., forma **madocarpus** (Piper), comb. nov. *T. curvipes* Hook., subsp. *madocarpus* Piper, Contrib. U. S. Nat. Herb. xi. 306 (1906).

This form, which differs from the typical state only in having its pods glabrous instead of puberulent, in many localities is the more common. It seems desirable, therefore that it should be named but I do not think that it merits more than the rank of form since most species of the genus exhibit the same variation and since often plants with glabrous and with pubescent pods are found growing in proximity.

MIRABILIS MULTIFLORA (Torr.) Gray, var. **glandulosa** (Standl.), comb. nov. *Quamoclidion multiflorum* Torr., subsp. *glandulosum* Standl. Contrib. U. S. Nat. Herb. xii. 359 (1909).

MIRABILIS MULTIFLORA (Torr.) Gray, var. **obtusa** (Standl.), comb. nov. *Quamoclidion multiflorum* Torr., subsp. *obtusa* Standl., l. c.

Prof. Jepson in his Flora of California iv. 457 (1914) has referred the segregate genera *Quamoclidion* and *Hesperonia*, recently taken up by Standley, to *Mirabilis*. This interpretation of the latter genus accords with the work of Watson, Gray and Greene. The known range of the variety *glandulosa* of *M. multiflora* has been extended from Colorado to Arizona as indicated by specimens secured at the Grand Cañon by Mrs. Spencer, June, 1916.

Petalostemum Grothii, spec. nov., undique glabrum circa 3 dm. altum; caulibus mediocriter gracilibus; foliis 3–5-foliolatis; foliolis paullo involutis linearibus cuspidatis parce glandulosis; spicis longius pedunculatis ex ovatis demum cylindricis densifloris; bracteis persistentibus abrupte aristatis, basi sericeo-villosa ovata; calycis dentibus glabratis subaequalibus tubo sericeo-villoso brevioribus; floribus rosea-purpureis; stylo a basi ad medium barbato. — TEXAS: in gravelly soil near Bracken, Bexar Co., July 25, 1903, *B. H. A. Groth*, no. 148 (TYPE, Gray Herb.).

This species is closely related to *P. virgatum*, having the long peduncles and partially glabrous calyx of that species but much shorter calyx-lobes and pubescent style-base. The calyx, except for the glabrous teeth, is similar to that of *P. purpureum* but the bracts of the latter are not persistent. When Dr. Greenman was at the Gray Herbarium a number of years ago he studied this *Petalostemum* and in notes which he made at that time he indicated the distinctive characters as given above. He did not pursue the matter to the point of publication, however, and has generously given me permission to publish the species.

FUNASTRUM Fourn. Ann. Sci. Nat., ser. 6. xiv. 388 (1882). Schlechter has recently shown in Fedde, Rep. Spec. Nov. xiii. 279–282 (1914) the necessity of adopting the name *Funastrum* Fourn., l. c., for the group of plants comprising the genus *Philibertella* Vail, Bull. Torr. Club xxiv. 305 (1897). Since Schlechter discusses in great detail the relation of this genus to *Philibertia* HBK. and presents the synonymy of both genera, it seems unnecessary to restate this information. However, in spite of the fact that he corrects Malme's error, Arkiv iv. no. 14. 2 (1905) of failing to take up the first published generic name, he has not consistently applied this principle to species but has followed Miss Vail's adoption of specific names, at least one of which conflicts with both Sect. 6, Art. 48 of the International Rules and Sect. 3, Canon 9, (a) of the American Code. Accordingly the following new combinations are necessary.

Funastrum lineare (Dcne.), comb. nov. *F. Hartwegii* (Vail) Schltr. in Fedde, Rep. Spec. Nov. xiii. 285 (1914). *Sarcostemma lineare* Dcne. ex Benth. Pl. Hartw. 25 (1840). *Philibertia linearis* (Dcne.) Gray, Proc. Am. Acad. xii. 64 (1877). *Philibertella Hartwegii* Vail, Bull. Torr. Club xxiv. 308 (1897).

FUNASTRUM LINEARE (Dcne.) Macbr., var. **heterophyllum** (Engelm.), comb. nov. *Sarcostemma heterophyllum* Engelm. ex Torr. Pac. Rail. Rep. v. 362 (1857). *Philibertia linearis* (Dcne.) Gray, var. *heterophylla* (Engelm.) Gray, Syn. Fl. ii. pt. 1. 88 (1878). *Philibertella Hartwegii* Vail, var. *heterophylla* (Engelm.) Vail, Bull. Torr. Club xxiv. 308 (1897). *P. heterophylla* (Engelm.) Ckll. Bot. Gaz. xxvi. 279 (1898).

FUNASTRUM HIRTELLUM (Gray) Schltr. in Fedde, Rep. Spec. Nov. xiii. 286 (1914). *Sarcostemma heterophyllum* Engelm., var. *hirtellum* Gray, in Brewer & Wats. Bot. Cal. i. 478 (1876). *Philibertia linearis* (Dcne.) Gray, var. *hirtella* Gray, Syn. Fl. ii. pt. I. 88 (1878). *P. hirtella* (Gray) Parish, Muhl. iii. 126 (1907). *Philibertella hirtella* (Gray) Vail, Bull. Torr. Club xxiv. 309 (1897).

The synonymy of this plant as given by Miss Vail, l. c., is not correct and as given by Schlechter is incomplete. The species is very near the preceding but since it does not seem to intergrade with *F. lineare* it may be retained. It is noteworthy that Parish, who knows both plants in the field (as indicated by his collections) regards *F. hirtellum* as worthy specific recognition.

Funastrum bicolor (Dcne.), comb. nov. *Sarcostemma bicolor* Dcne. in DC. Prod. viii. 541 (1844). *Philibertia bicolor* (Dcne.) Gray, Proc. Am. Acad. xxi. 395 (1886).

This Mexican species is very closely related to *F. elegans* (Dcne.) Schltr. as indicated by Gray, l. c., and Schlechter has followed Hemsley in regarding it as synonymous. It is true that one or two collections appear to be intermediate in character, as pointed out by Dr. Gray, but I am inclined to follow him in keeping up both species since they are on the whole easily recognized. *F. bicolor* is typically canescent with a dense pubescence and occurs much farther north and not so far south as *F. elegans*.

FUNASTRUM CYNANCHOIDES (Dcne.) Schltr., var. **subtruncatum** (Robinson & Fernald), comb. nov. *Philibertia cynanchoides* (Dcne.) Gray, var. *subtruncata* Robinson & Fernald, Proc. Am. Acad. xxx. 119 (1894).

Funastrum bilobum (Hook. & Arn.), comb. nov. *Sarcostemma bilobum* Hook. & Arn. Bot. Beech. Voy. 438 (1841). *Philibertia biloba* (Hook & Arn.) Gray, Proc. Am. Acad. xxi. 395 (1886).

Dr. Gray, l. c., pointed out the improbability of this species being the same as *F. cynanchoides*: nevertheless Schlechter has followed Hemsley in reducing it to the latter. It is very doubtful if this disposition is correct but if it is Schlechter erred in not taking up Hooker and Arnott's name since it has three years priority over that of Decaisne. Both Miss Vail and Schlechter include in the synonymy of *F. cynanchoides*, *Gonolobus viridiflorus* Torr. Ann. Lyc. N. Y. ii. 219 (1828), not Nutt. In reality this is a name only and merely represents a misdetermination on the part of Torrey. Just why it should be unearthed is not clear unless for the purpose of adding to a synonymy already overburdened.

GILIA VIRGATA AND ALLIES. My attention has been called to this group because of some excellent specimens collected by Mrs. Mary F. Spencer in the vicinity of San Diego where this section (Hugelia) of the genus Gilia culminates in a number of variable and perplexing forms. The group has been studied critically and, indeed, with rare discrimination by Dr. Brand in his recent comprehensive monograph of the *Polemoniaceae*, Das Pflanzenreich iv. 250. 164–168 (1907), but there are errors in his treatment which should be corrected; and furthermore, his inclusion of *Hugelia* in *Navarretia*, thus greatly broadening the scope of that genus, so characteristic and singular in aspect as interpreted by Ruiz and Pavon, Bentham, Greene, and others, is a move, the wisdom of

which, it seems to me, is extremely doubtful. Dr. Rydberg has called attention to the errors in Brand's work, Bull. Torr. Club xl. 466 (1913) as regards some of the species of the Rocky Mountains. He is undoubtedly correct in his surmise that Brand's misinterpretations have originated in his inability to study the types of species concerned. Botanists, however, it occurs to me, will view with great charity errors arising from lack of data of this character, since it is a disadvantage under which all labor at times, and because of which all err. Accordingly, the criticism "He made definite pronunciations as to species he had never seen, and made synonyms from mere guesses" will seem to many to be, if not an unjust remark, at least an unwise one, which may too easily serve as a boomerang for the person who first launches it. But to return to Brand's treatment of the plants we have in mind. In the first place he seems to have missed completely one of the outstanding characteristics of *G. densifolia*, namely the woody character of the base and of the lower portions of the stems. His key character by which he separates this species from all the others is "Tubus corollae calyce duplo vel triplo longior," a character which is true enough but which applies also to specimens by Douglas of *G. virgata* in this herbarium from the Herb. Soc. Hort. Lon. and which, without doubt rightfully, purport to be a part of the material upon which *G. virgata* was based. The use by Brand of this corolla-character caused him to describe a variety *lanata* which he based on Heller no. 6753 from Monterey County, and which in point of fact is an exact duplicate of Douglas' material of *G. virgata* probably from the same region since he made his headquarters at Monterey during his stay in California. The next species Brand considers is *G. Wilcoxii* which he distinguishes by the character "Semina sub aqua immutata." Unfortunately mature seeds of type and co-type material have always developed mucilaginous spiricles in water every time I have tried the experiment. Brand gives no other character to distinguish this plant from *G. filifolia* and I have been unable to find any. His treatment of the latter is proper it seems to me but he fails to use in his key the strongest character of this plant, and the one upon which Dr. Gray placed greatest stress, namely the small anthers. The species certainly merges in California with the var. *floccosa* of *G. virgata* but nevertheless it is usually distinct enough even there and is the only

species that occurs in the Northwest. *Gilia virgata* is the next species in Brand's treatment and his lack of knowledge as to the true character of this plant has been shown above. His separation of the var. *floccosa* as a subspecies, based on the degree of bract-development in relation to the inflorescence appears to be a highly artificial distinction which, moreover, does not work out satisfactorily. The real points of difference between *G. virgata* and the var. *floccosa* have been indicated by Miss Milliken, Univ. Cal. Publ. Bot. ii. 40 (1904). But the principal point at issue here, as in the case of *G. densifolia*, concerns the character of the collection upon which the species was based. Unfortunately in this instance the problem is doubly perplexing because Gray did not indicate a specific collection in describing *G. floccosa*, Proc. Am. Acad. viii. 272 (1870) but merely designated the range, "California to Arizona, interior of Oregon and Utah." However, it is possible to gain a very accurate conception of the plant to which Dr. Gray meant this name to apply since at that time (1870) he had relatively few specimens and those that he referred to this species are so labeled in his own hand. In this connection I would mention that the stickler for technicalities will doubtless refuse to accept the name *G. floccosa* for the blue-flowered plant Gray really applied it to, because Gray, as shown by the context, thought he was giving a new name to *G. lutea*, this name being inappropriate because the flowers were not yellow. Later, in the Syn. Fl. ii. pt. i. 143 (1878) he corrects this mistaken idea in regard to *G. lutea* and retains the name *G. floccosa* for the blue-flowered plant he at one time considered identical with *G. lutea*. The meagre material Gray had is satisfactory explanation for this confusion of these species, since the dried flowers of *G. lutea* give no proof of having been yellow and the habit and vegetative characters of the two species are very similar. Since then, as indicated by his annotations in the herbarium, he applied the name *G. floccosa* in large part to the plant with blue flowers rather than to the yellow-flowered species, in the real sense unknown to him, the adoption of the name for the former species is surely proper. And those specimens which were before him in 1870 and are labeled "*G. floccosa*" are not to be distinguished from specimens cited by Brand as *Navarretia virgata*, var. *dasyantha* Brand and *N. densifolia*, var. *jacumbana* Brand, and which represent the two extremes of *G. floccosa* in the development of the corolla-tube in relation to its lobes.

This brings us to a consideration of the generic position of this group of plants. Anything bordering on a complete discussion of this matter would require pages. Suffice it to say that almost all, if not all, American botanists have been content to consider these species as representing a subgenus of Gilia. This is the more significant when it is remembered that several segregate genera of Gilia have been proposed and to some extent adopted in recent years. Brand's removal of this section to *Navarretia*, therefore, was epoch-making. In his key to genera he separates this genus by the character " calycis dentes inaequalis." In view of the fact that species of *Eunavarretia* are distinguished by the degree to which this character exists its weakness as a generic distinction is apparent. Furthermore in species of the section *Hugelia*, at least, the calyx-teeth may be essentially equal. Then, too, the habital distinctiveness of *Navarretia*, one of its strongest (and a necessary) asset, is ruined by the inclusion of the *Hugelia* group. It is true that the recently discovered *N. Abramsii* because of its woolly character suggests a close relationship between the groups but after all it is a better *Navarretia* than anything else. Finally the complexity of the matter has been increased by the publication of the genus *Eriastrum* Wooton & Standl. Contrib. U. S. Nat. Herb. xvi. 160 (1913), the authors pointing out, l. c. xix. 520 (1915), that their genus is related to *Collomia* because it too possesses the character "Calyx not ruptured by the capsule," a character heretofore given, even by Brand, as peculiar to *Collomia*. Indeed all of this seems to bear out the contention expressed in Bot. Gaz. lxi. 34 (1916) that this character "is scarcely to be considered generically in a family in which the more natural genera run hopelessly together technically." It seems advisable therefore to keep the section *Hugelia* in the genus *Gilia*, as has been done by Gray and most botanists, including those of California who know the species in the field.

The plants here discussed may be summarized as follows.

a. Perennial, the stems woody toward the base; corolla large, the tube 2–4 times as long as the calyx.
  Leaves subappressed, imbricated, entire or pinnatifid, greenish ..... 1. *G. densifolia*.
  Leaves spreading, not imbricated, usually irregularly pinnatifid and white-tomentose ..... 1a. var. *elongata*.

a. Annual or biennial, the stems herbaceous to the base; corolla-tube often less than 2 times as long as the calyx *b*.

b. Anthers 1 mm. or less than 1 mm. long, scarcely exserted from the corolla-throat; corolla pale blue, the narrow lobes much shorter than the tube *c.*
c. Stems erect from the base.
Flowers capitate-glomerate . . . . . 2. *G. filifolia.*
Flowers solitary or 2-3 in a head . . . . . 2a. var. *sparsiflora.*
c. Stems decumbent at base, branched . . . . . 2b. var. *diffusa.*
b. Anthers 1.3–2 mm. long, exserted from the corolla-throat, usually distinctly so; corolla pale or dark blue or yellow, the lobes at least one half as long as the tube *d.*
d. Corolla, at least the throat and lobes, blue; ovules seldom if ever solitary in the cells *e.*
e. Leaves entire or some 3-parted; heads at least 3-flowered, nearly glabrous to densely lanate *f.*
f. Inflorescence involved in dense wool; flowers in capitate-glomerules.
Stems simple, virgate or with a few short branches; corolla dark blue, the lobes about one half as long as the tube . . . . . 3. *G. virgata.*
Stems often much branched; corolla usually paler, the lobes often about as long as the tube . . . . . 3a. var. *floccosa.*
f. Inflorescence sublanate to nearly glabrous; flowers, at least some of them, scattered or in clusters of 3–6 . . . . . 3b. var. *sapphirina.*
e. Leaves mostly 3–7-pinnatifid; heads many-flowered, densely lanate; plants corymbosely branched . . . . . 4. *G. pluriflora.*
d. Corolla yellow; ovules 1–2 in the cells . . . . . 5. *G. lutescens.*

1. G. DENSIFOLIA Benth. in DC. Prod. ix. 311 (1845). — SOUTHERN CALIFORNIA: Kernville, April–Sept., 1897, *Purpus*, no. 5506; Mt. Pinos, July, 1875, *Rothrock*, no. 204; 1833, *Douglas*; near Seven Oaks, San Bernardino Mts., June 25, 1895, *Parish*, no. 3685.

1a. var. ELONGATA (Benth.) Gray ex Brand, Pflanzenreich iv. 250. 165 (1907). *Navarretia densifolia* (Benth.) Brand, subsp. *elongata* (Benth.) Brand, l. c. — Southern California to adjacent Nevada, Arizona and Lower California. — NEVADA: 1871, *Wheeler*. CALIFORNIA: 1833, *Douglas*; San Diego Co., *Palmer*, no. 232; San Bernardino, Aug. 1881, *S. B. & W. F. Parish*, nos. 314, 315; Mt. San Antonio, San Bernardino Co., July 11, 1902, *Abrams*, no. 2682; Los Angeles Co., July 2–4, 1908, *Abrams & McGregor*, no. 554; Palmdale, Mohave Desert, June 31, 1908, *Abrams & McGregor*, (cited by Brand as *Navarretia virgata*, var. *floribunda*); Crafton, May, 1876, *Lemmon*, no. 11; San Bernardino, July 15, 1896, *Parish*, no. 4178; Santa Ana River bottoms, June 26 and Oct. 16, 1910, *Reed*, no. 3107; Lytle Creek, June 29, 1909 and Oct. 13, 1910, *Parish*, no. 7139. (The last four numbers represent the large-flowered var. *sanctora* Milliken). LOWER

California: July, 1884, *Orcutt*, no. 1092; about 20 miles below boundary, *Cleveland*.

Navarretia virgata (Benth.) Brand, var. *oligantha* Brand, l. c. 168, is based on one specimen cited "Gesehen nur aus Nieder-Californien (*Orcutt*; Herb. Gray)." There are three specimens in the Gray Herbarium by Orcutt from Lower California but the only one which at all coincides with Brand's meager description "Flores singuli vel gemini, bracteae subnullae" bears no other data than "Mts., Lower California, 1833" and is apparently a glabrate variety of *G. densifolia*. But only the upper portion of the plant is present; and if this is the specimen Brand refers to, and it seems that it must be, his description is misleading.

2. G. filifolia Nutt. Journ. Acad. Phil. i. 156 (1848). *G. virgata* (Benth.) Steud., var. *filifolia* Milliken, Univ. Cal. Publ. Bot. ii. 39 (1904). *G. floccosa* Gray, var. *filifolia* (Nutt.) Nels & Macbr. Bot. Gaz. lxi. 35 (1916). *G. Wilcoxii* A. Nels. Bot. Gaz. xxxiv. 27 (1902). *Hugelia floccosa* Nutt. ex Gray, Proc. Am Acad. viii. 272 (1870), as to name only. *Navarretia Wilcoxii* (A. Nels.) Brand, l. c. 165. *N. filifolia* (Nutt.) Brand, l. c. 167. *Eriastrum filifolium* Woot. & Standl. Contrib. U. S. Nat. Herb. xvi. 160 (1913). — Southern California to Nevada, southern Idaho, Oregon and southeastern Washington. — Idaho: St. Anthony, July 4, 6, and 8, 1901, *Merrill & Wilcox*, nos. 822, 862, and 952; Nampa, July 14, 1911, *Macbride*, no. 1069, also July 2, 1892, Three Creek, Owyhee Co., July 1, 1912, *Nelson & Macbride*, no. 1867; King Hill, Elmore Co., July 15, 1911, *Nelson & Macbride*, no. 1093; Tikura, Blaine Co., July 22, 1911, *Nelson & Macbride*, no. 1289; Big Willow, Canyon Co., May 31, 1910, *Macbride*, no. 163. Nevada: Between Washoe and Franktown, July 22, 1912, *Heller*, no. 10603a; King's Cañon, Ormsby Co., July 3, 1902, *Baker*, no. 1234. California: Mt. Pinos, Ventura Co., July 12–14, 1908, *Abrams & McGregor*, no. 199; southeastern Cal., April–Sept. 1897, *Purpus*, no. 5482; Santa Barbara, *Nuttall*; San Isabel, *Thurber*, no. 624; near Potrero, San Diego Co., June 3, 1903, *Abrams*, no. 3724. Oregon: near Devine Ranch, June 27, 1896, *Leiberg*, no. 2408; Bend, Crook Co., July 10, 1905, *Elias Nelson*, 861; Anderson Valley, June 24, 1896, *Leiberg*, no. 2385; near Desert Well, south of Button Springs, July 5, 1894, *Leiberg*, no. 387. Washington: north of Bickleton, Yakima Co., June 7, 1884, *Suksdorf*, no. 393; Moses' Coulee, Aug. 8, 1892, *Lake & Hull*, no. 590; junction Crab and Wilson Creeks, Douglas Co., June 21, 1893, *Sandberg & Leiberg*, no. 246; sagebrush areas, Yakima region, July, 1883, *Brandegee*, no. 966.

2a. var. **sparsiflora** (Eastw.), comb. nov. *G. sparsiflora* Eastw. Proc. Cal. Acad. Sci. ser. 3, ii. 291 (1902). *Navarretia filifolia* (Nutt.) Brand, subsp. *sparsiflora* (Eastw.) Brand, l. c. 167. — Eastern central California to Nevada. — NEVADA: Eagle Valley, Ormsby Co., July 3, 1902, *Baker*, no. 1403.

2b. var. DIFFUSA Gray, Proc. Am. Acad. viii. 272 (1870). *Navarretia filifolia* (Nutt.) Brand, var. *diffusa* Gray, ex Brand, l. c. 167. — Western Texas to southeastern California and Nevada. — TEXAS: near El Paso, *Parry*. UTAH: Upper Santa Clara, June, 1874, *Parry*, no. 195. NEVADA: Unionville Valley, June, 1865, *Watson*, no. 915; plains along Humboldt River, 1872, *Gray*. NEW MEXICO: 1851–52, *Wright*, no. 1642. ARIZONA: Fort Lowell, 1880, *Lemmon*; near Tucson, March, 1877, *Greene*, no. 1108. CALIFORNIA: San Diego Co., May 28, 1916, *Mrs. Mary F. Spencer*.

3. G. VIRGATA (Benth.) Steud. Nom. ed. 2, i. 684 (1840). *Navarretia virgata* (Benth.) Brand, l. c. 167. *N. densifolia* (Benth.) Brand, var. *lanata* Brand, l. c. 165. — Monterey County, to San Bernardino. — CALIFORNIA: near Monterey, 1860–62, *Brewer*, no. 642; 1832, *Douglas*; near Seaside, Monterey Co., May 19, 1903, *Heller*, no. 6753; Santa Monica Range, 1901–05, *Grant*, no. 00131; Claremont, Los Angeles Co., July 20, 1903, *Baker*, no. 3345; San Bernardino, May 2, 1896, *Clara E. Cummings*. The last three collections are transitional to the variety *floccosa*.

3a. var. FLOCCOSA (Gray) Milliken, Univ. Cal. Publ. Bot. ii. 40 (1904). *G. lanata* (Lindl.) Walp. Ann. i. 519 (1848–49) ? *G. floccosa* Gray, Proc. Am. Acad. viii. 272 (1870). *G. floccosa* Gray, var. *ambigua* Jones Contrib. W. Bot. xiii 2 (1910). *G. virgata* (Benth.) Steud., var. *Yageri* Jones, l. c. *Hugelia lanata* Lindl. Journ. Hort. Soc. iii. 74 (1848) ? *H. floccosa* (Gray) Howell, Fl. N. W. Am. 458 (1901). *Navarretia virgata* (Benth.) Brand, subsp. *floccosa* (Gray) Brand, l. c. 168. *N. virgata* (Benth.) Brand, var. *dasyantha* Brand, l. c. *N. densifolia* (Benth.) Brand, var. *jacumbana* Brand, Ann. Conserv. et Jard. Bot. Genève xv. & xvi. 340 (1913). — Southern California to Nevada, Utah and Arizona. — UTAH: Valley of the Virgin, near St. George, 1874, *Parry*, no. 192. NEVADA: 1865, *Torrey*, no. 313; Truckee Desert, July, 1867, *Bailey*, no. 914; Canyon Station, Clarke Co., June 6, 1912, *Heller*, no. 10435. ARIZONA: Ward's Canon, Clifton, *Davidson* no. 157. CALIFORNIA: Providence Mts., 1860–61, *Cooper*; near Lone Pine, Inyo Co., June 7, 1891, *Coville & Funston*, no. 886; 1866, *Bolander*, no. 6411; Owens Valley and at Fort Tejon, 1863, *Dr. Horn*, no. 2850; Liebre Mts., Los Angeles Co., June 20–25, 1908, *Abrams & McGregor*, no. 359; San Gabriel Mts., Los Angeles Co., July 2–4, 1908, *Abrams & McGregor*, no. 546; San Bernardino, July 20, 1895, *Parish*, no. 3803; Panamint Valley, Inyo Co., May 10, 1915, *Parish*, no. 10162; Walker Pass, April–Sept., 1897, *Purpus*, no. 5391; near Cucamonga, July 8, 1902, *Abrams*, no. 2660; Jacumba, May 29, 1903,

Abrams, no. 3640; Livingston, Merced Co., Sept. 21, 1893, *Congdon;* Maricopa hills, Kern Co., May 15, 1913. *Eastwood.* no. 3272.

3b. var. **sapphirina** (Eastw.), comb. nov. *G. sapphirina* Eastw. Bot. Gaz. xxxviii. 71 (1904). *Navarretia virgata* (Benth.) Brand, var. *sapphirina* (Eastw.) Brand, l. c. 168. — SOUTHERN CALIFORNIA: Sierre Madre, Los Angeles Co., July 2, 1902, *Abrams*, no. 2636; *Coulter*, no. 452; San Diego, 1883, *Orcutt*, also 1874, *Cleveland;* Curcimaca Mts., San Diego Co., July 1875, *Palmer*, no. 236; Witch Creek, San Diego Co., July, 1894, *Alderson;* Lytle Creek, July 15, 1902, *Abrams*, no. 2742; San Bernardino, July, 1881, *S. B. & W. F. Parish*, nos. 1748 and 1748–A (cited by Brand under var. *dasyantha;* transitional state); San Diego Co., July 12, 1916, *Mrs. Mary F. Spencer.*

4. G. PLURIFLORA Heller, Muhl. ii. 113 (1906). *G. virgata* (Benth.) Steud., var. *floribunda* Gray, Proc. Am. Acad. viii. 272 (1870), not *G. floribunda* Gray, l. c. 267. *Navarretia virgata* (Benth.) Brand, var. *floribunda* (Gray) Brand, l. c. 168. *N. densifolia* Brand, Ann. Conserv. et Jard. Bot. Genève xv. & xvi. 340 (1913), not Benth. — SOUTHERN CALIFORNIA: Corral Hollow, 1860–62, *Brewer*, no. 1212; 1876, *Palmer*, no. 414; Fort Tejon, Kern Co., June, 1888, *Parish*, no. 1897; San Joaquin plains near Lathrop, June, 1896, *Jepson;* South Fork Kaweah River, Tulare Co., July 21, 1904, *Culbertson*, no. 4518; Sunset, Kern Co., April 20, 1905, *Heller*, no. 7734; also Oil City, April 22, no. 7742.

5. G. LUTESCENS Steud. ex Benth. in DC. Prod. ix. 311 (1845). *Hugelia lutea* Benth. Bot. Reg. xix. sub t. 1622 (1833) not *G. lutea* (Benth.) Steud. *Navarretia lutea* (Benth.) Brand, Pflanzenreich iv. 250. 168 (1907). — Central California in the coastal region to Los Angeles County. — CALIFORNIA: Ravenna, Los Angeles Co., June and Aug., 1910, *Mrs. K. Brandegee;* San Luis Obispo Co., 1878, *Lemmon;* also May 10, 1899, *Jared;* 1833, *Douglas;* between Nacimiento River and Gorda, Monterey Co., June 9, 1909, *Mrs. K. Brandegee.*

CORDYLANTHUS RIGIDUS (Benth.) Jepson, var. **filifolius** (Nutt.), comb. nov. *C. filifolius* Nutt. ex Benth. in DC. Prod. x. 597 (1846). *Adenostegia filifolia* (Nutt.) Abrams, Fl. Los Ang. 372 (1904).

CORDYLANTHUS RIGIDUS (Benth.) Jepson, var. **brevibracteatus** (Gray), comb. nov. *C. filifolius* Nutt., var. *brevibracteatus* Gray, in Brewer & Wats. Bot. Cal. i. 622 (1876). *Adenostegia rigida* Benth., var. *brevibracteata* (Gray) Greene, Pitt. ii. 180 (1891).

Abrams, l. c., excludes *C. rigidus* from southern California stating that it, in comparison with *C. filifolius*, "has broader leaves and bracts which are less hispid," while Jepson, Fl. W. Mid. Cal. ed. 2. 387 (1911) follows Gray, Syn. Fl. ii. pt. I. 303 (1878) and Bentham, l. c., in regarding it as the same as *C. filifolius.*

The true state of affairs would seem to be more correctly represented by treating the southern plant, *C. filifolius*, as a geographical variant of *C. rigidus*, from which it may be distinguished by the narrower leaves and more strongly setose-hispid bracts. Abrams is mistaken, however, in thinking that *C. rigidus* does not occur in southern California since a specimen in the Gray Herbarium collected by Dr. Palmer in 1876 on " hills behind San Diego " matches well material from Monterey County where Douglas probably secured the original collection. The variety *brevibracteatus* is in some respects intermediate to the typical form and the variety *filifolius* but the fewer flowers in the head distinguish it. Besides the original collection from Kern County there is a specimen in this herbarium from Tulare County secured in 1891 by Coville & Funston, no. 1602.

STENOTOPSIS LINEARIFOLIUS (DC.) Rydb., var. **interior** (Coville), comb. nov. *S. interior* (Coville) Rydb. Bull. Torr. Club xxvii. 617 (1900). *Aplopappus interior* Coville, Proc. Biol. Soc. Wash. vii. 65 (1892). *A. linearifolius* DC., var. *interior* (Coville) Jones, Proc. Cal. Acad. ser. 2, v. 697 (1895). *Stenotus linearifolius* (DC.) T. & G., var. *interior* (Coville) Hall, Univ. Cal. Publ. Bot. iii. 48 (1907).

Doctor Hall, l. c., has given conclusive proof of the intergradation of this desert form with the typical state of the species. I think that Dr. Rydberg is right, however, in retaining the genus *Stenotopsis* as distinct from *Stenotus*.

IV. NEW OR OTHERWISE INTERESTING PLANTS FROM IDAHO

By J. Francis Macbride and Edwin Blake Payson

During the summer of 1916 we had the good fortune to be able to spend six weeks in botanical exploration in the south-central portion of Idaho. Practically the entire time was spent in Blaine and Custer Counties which represent probably the least known portion of the state, topographically as well as botanically, since portions of the scarcely "navigable" lava fields which cover a large part of Blaine County are unknown and since Custer County has only one railroad point and that at Mackay near the south-eastern boundary. The region is additionally interesting to the botanist because of the great variation in the climatological conditions that exist in close proximity. Consequently in passing from the low and excessively dry lava fields to the foothills and mountain valleys and finally to the higher summits of the Sawtooth Range where the snow banks never completely melt away one encounters great diversity in environmental conditions which have resulted in the formation of many distinct types of vegetation ranging from essentially desert in the lava fields to alpine at the summits of the higher peaks. These higher summits in this part of the state are largely granitic in character but in the vicinity of Mackay they are, in part, composed of limestone. The latter formation was visited in 1911 by Nelson and Macbride and then, as this year when it was more carefully explored, yielded many things that were not discovered on the granitic peaks of the region. In spite of the fact that our time and our capacity for carrying presses was strictly limited we secured in the 1000 miles we travelled 1000 numbers, most of which consisted of twelve sheets. Unfortunately we were compelled because of lack of time and carrying space to take only the rarer and more important things and to confine duplication to the less usual or unrecognized species. Consequently the collection is not as representative of this region of the state as it might be. Nevertheless a critical study of the specimens has disclosed the fact that we secured many rare or little known species, many new to the state and upwards of a dozen apparently undescribed.

RANUNCULUS INAMOENUS Greene. This species, frequent in the central Rocky Mountains is represented now from Cape Horn, Custer County, Idaho by our number 3621.

RANUNCULUS INTERTEXTUS Greene, Ottawa Nat. xvi. 33 (1902). Our number 3372 from Squaw Creek, Custer County, Idaho well represents this species which is *R. natans* C. A. Meyer of the Coulter-Nelson Manual of Rocky Mt. Botany. Meyer's species, however, is Asian and if we may judge from the plate of it in Ledeb. Ic. 114, Greene was quite justified in proposing the plant of North America as a distinct species. *R. intertextus* does not appear to have been collected before in Idaho although it occurs occasionally in Colorado, Wyoming, and Spokane County, Washington.

CLEMATIS ORIENTALIS L. *C. crux-flava* Ckll. Science n. ser. x. 898 (1899) and *C. aurea* Nels. & Macbr. Bot. Gaz. lv. 373 (1913) should be referred to this species. Wooton and Standley in their Flora of New Mexico remark that "*C. orientalis* is reported to have escaped near Las Vegas but . . . . . it is not likely to become a permanent part of our flora." This observation may be true as regards New Mexico but the species is not only well established but spreading in the vicinity of Challis, Idaho. It was collected there first in 1909 and this year (1916) it was noticeably more common. It clambers over wild thickets along streams and appears to be native. Macoun secured it in 1901 at Port Colburne, Ontario and his label bears the inscription "well established." We wish to express our indebtedness to Mrs. Earl J. Michael of Challis who kindly prepared for us the neatly pressed flowers and fruits which supplement our foliage specimens gathered July 21. The collection is numbered 3355.

AQUILEGIA FLAVESCENS Wats., var. **miniana,** var. nov., sepala albido-rubra vel ad colorem salmonis accedens. — IDAHO: stream bank, Challis Creek, Custer Co., July 19, 1916, *Macbride & Payson*, no. 3326 (TYPE, Gray Herb.); also protected rocky hillside, Bonanza, July 28, no. 3487; crevices of granitic rock, Smoky Mts., Blaine Co., Aug. 13, no. 3751; also along alpine brook, Sawtooth Peaks, Aug. 9, no. 3692.

It has been recognized for some time that *A. flavescens* and *A. formosa* merge in the territory where their ranges join. As a result there exist many intermediate forms which cannot be definitely referred to either of these species. One such state has been evolved in central Idaho and there in many localities entirely replaces the

typical form of the species, so apparently it has acquired a certain degree of stability. This form is similar to *A. flavescens* except that the sepals are salmon-color or flushed with pink. This color-modification is striking and extremely beautiful, well worth, it would seem varietal recognition.

Aconitum columbianum Nutt. In the vicinity of Cape Horn, Custer Co., Idaho a form of this species with light-colored flowers (our no. 3642) seems to entirely replace the typical state which was found forty or fifty miles south of Cape Horn in the region of the Alturas Lakes. This appearance in restricted areas of forms with light-colored corollas has been observed before since we have at hand a specimen by Horner from the Blue Mts. of Washington which bears on the label this note, "flowers all white in this locality." Neither Horner's collection nor ours, however, appears to differ in any fundamental way from the typical dark-flowered form.

Sisymbrium Loeselii L. This Italian species is represented by our no. 2965 from Picabo, June 30, 1916. It was common along a roadway for some distance and will doubtless persist from year to year. Apparently it has not been collected in the United States before except in Connecticut and New York.

Draba valida Goodd. Bot. Gaz. xxxvii. 55 (1904). The discovery of this species in central Idaho (our no. 3138), hitherto known only from the Uintah Mts. of Utah is a range-extension that is plausible but noteworthy.

Arabis nubigena, spec. nov., *A. microphylla* affinis, duplo minor, caudice lignoso multo minus ramoso, nunc trifurca nunc bifurca tantum; caulibus 3–6 gracilibus erectis circa 8 cm. altis; foliis radicalibus 5–10 mm. longis fere linearibus vel anguste oblanceolatis 5–10 mm. longis 1–1.5 mm. latis utrinque parce stellato-pubescentibus; foliis caulinis paucis reductis glabris; floribus circa 4; sepalis glabris circa 3 mm. longis anguste albo-marginatis; corolla purpureo-tincta 5–6 mm. longis; pedicellis fructiferis fere erectis 6–7 mm. longis; siliquis lineari-oblongis acutiusculis strictissime erectis 2–3.5 cm. longis circa 2 mm. latis; seminibus circa 2.5 mm. longis et 1.5 mm. latis valde alatis. — Idaho: exposed alpine summit, Smoky Mts., Blaine Co., Aug. 13, 1916, *Macbride & Payson*, no. 3772 (Type, Gray Herb.).

This dainty little alpine perennial is closely related to *A. microphylla* Nutt. which is a larger plant with larger leaves but very

small wingless or nearly wingless seeds. The caudex of Nuttall's species becomes in age much branched so that the stems are then more numerous than they ever are in *A. nubigena*. *A. acutina* and *A. tenuicula* Greene, Leaflets ii. 82 (1910) are scarcely to be distinguished from *A. microphylla* Nutt.

EPILOBIUM OBCORDATUM Gray is not uncommon in the Sierra Nevada of California and is known from northern Nevada by a specimen secured by Watson in the East Humboldt Mountains. Recently Cusick has collected it in the Strawberry Mountains of eastern Oregon. Its discovery in the Sawtooth Mountains of central Idaho is not, therefore, particularly surprising but nevertheless this apparently unrecorded extension in its range seems worthy of note. Our collection bears number 3705 and was found growing in rock-crevices at an altitude of 10,000 ft.

DODECATHEON PAUCIFLORUM (Durand) Greene, var. **exquisitum,** var. nov., glabrum gracilum 1–1.5 dm. altum; foliis anguste oblanceolatis obtusis basi in petiolum attenuatis 4–6 cm. longis 5–8 mm. latis; floribus 1–4; pedicellis fructiferis 1–1.5 cm. longis; corollae lobis solum circa 10 mm. longis. — IDAHO: alpine basin, Smoky Mts., Custer Co., Aug. 15, 1916, *Macbride & Payson*, no. 3747 (TYPE, Gray Herb.).

The well-known *Dodecatheon pauciflorum* is common in typical form in the mountains of southern Idaho. It is normally a very robust plant with numerous large showy flowers and ample leaves. It was a distinct surprise, therefore, upon studying the plant described above to find, except for its uniformly much smaller size in all parts, that it was referable to *D. pauciflorum*. Nevertheless it seems almost incongruous to refer this attractive and dainty shooting star which was abundant on the dryer portions of the grasslands of an alpine meadow to Durand's plant which is typically of much lower altitudes and which presents an aspect so different. Accordingly we are designating this small isolated form as a new variety.

Dodecatheon exilifolium, spec. nov., mediocriter robustum 1.5–3 dm. altum supra minute glandulosum; rhizomis plus minusve elongatis; foliis glabris crassis oblongo-oblanceolatis 1–2 dm. longis, 1–1.5 cm. latis acutis margine integris vel paullo undulatis; umbella 2–6 floris; calyce 5-partita, laciniis lineari-lanceolatis acuminatis 5–7 mm. longis; corollae tubo flavo, lobis circa 12 mm. longis basi albis caeterum rubro-purpureis; staminibus distinctis,

basi purpureis; antherae 7–8 mm. longae acutiusculae; capsula calycem non superans, apice circumscissa demum 10 valvis dehiscens. — IDAHO: alpine basin west of Russian John Ranger Station, Smoky Mts., Custer Co., Aug. 13, 1916, *Macbride & Payson*, no. 3744 (TYPE, Gray Herb.).

This lovely plant is to be regarded as an addition to the group of closely related forms of which *D. Jeffreyi* Van Houtte is the type. Hall in Univ. Cal. Publ. Bot. iv. 202 (1912) has given a careful review of this group of species and has shown how variable *D. Jeffreyi* is. Nevertheless this Idaho plant can scarcely be considered, it seems to us, a mere variant of that typically broad-leaved species since it lacks the purple ring on the corolla-throat that is present in *D. Jeffreyi*. Moreover, as shown by Hall, the flowers of the latter are normally tetramerous while those of our plant are normally pentamerous. One variant of *D. Jeffreyi*, var. *redolens* Hall, is 5-merous usually but this plant is totally different in other respects from *D. exilifolium*. In aspect alone our species resembles *D. alpinum* (Gray) Greene and until the technical characters are observed might easily be mistaken for that plant. It is interesting that this unique species was found in the same alpine basin in which *D. pauciflorum*, var. *exquisitum* grew but whereas the latter occupied the dryer portions of the meadow-lands this plant flourished only in the moister areas.

GENTIANA SIMPLEX Gray. The range of this plant has long been known to extend from eastern Oregon to the Sierra Nevada of California but none of the books record its occurrence in Idaho and there are no specimens from that state in either the Gray or Rocky Mountain herbaria. Our number 3638 from Custer County, Idaho, differs from the Californian specimens in the nearly or quite entire corolla-lobes. These, in plants from the Sierra Nevada are distinctly erose or subfimbriate. The Oregon collections, however, exhibit this character usually in a degree much less pronounced and occasionally a plant may be found which has the lobes as nearly entire as in our material.

GILIA AGGREGATA (Pursh) Spreng., forma **aurea,** f. nov., corolla aurea. — IDAHO: Martin, Blaine Co., July 7, 1916, *Macbride & Payson*, no. 3082 (TYPE, Gray Herb.).

The golden-yellow corollas of this plant were in striking contrast to the vivid scarlet flowers of the typical form, common in the

vicinity of Martin. The species is well-known throughout southern Idaho by the Indian name, " tin-piute."

LAPPULA CINEREA Piper. Our specimens, no. 3577 from slide rock, Josephus Lakes, Custer Co., at an altitude of 9000 ft. add to the understanding of this species heretofore known only from Boise and Salmon River Bluffs at 3000 ft. or less. They are lower (2–5 dm.) than the collector's specimens cited by Piper, but otherwise represent the species perfectly.

LAPPULA FREMONTII (Torr.) Greene. This species is well represented by our no. 3214 from Challis, which seems to be the first collection from Idaho. Nelson and Macbride (Bot. Gaz. 61: 38, 1916) have restored Torrey's long suppressed name and cited specimens from Assiniboia, Wyoming, and Utah.

OREOCARYA NUBIGENA Greene. Dr. Hall of the University of California has kindly compared fruiting specimens of this imperfectly known species, which we were fortunate to secure from two localities, with Californian material in the University Herbarium. Dr. Hall writes: " The only specimen we have of *O. nubigena* in good fruit is one collected by Brewer at Sonora Pass. In this the nutlets are exactly like those of your specimen except that they are somewhat larger. This is perhaps due to their age. In other characters your plant is a very good match for the Brewer plant, as well as for two other specimens, one of which was presumably collected with the type. The uniformity in foliage, pubescence, calyx, and general appearance is remarkable. I may add that the nutlets in the Chestnut and Drew specimen [the type] are apparently like yours but only half grown." This careful comparison by Dr. Hall shows that the fruit-character for this species given in the key to *Oreocarya*, Contrib. Gray Herb. xlviii. 24 (1916) should be changed slightly to read " Nutlets not muriculate but somewhat rugose-tuberculate, the elevations low and blunt." The species is a good one and is nearest *O. echinoides* (as shown by its position in the treatment just cited) but it connects very closely the *O. glomerata* group, characterized by more or less rugose nutlets with the next group (of which *O. caespitosa* is typical), characterized by nutlets that are never truly rugose. Because of the heretofore obscure status of *O. nubigena*, it seems advisable to cite the following collections, all in the Gray Herbarium, except those referred to by Dr. Hall in letter quoted above; these are indicated by the abbreviation, Univ. Cal. Herb. IDAHO: Silver City, Owyhee Co., June 26,

1911, *Macbride*, no. 987; loose slide rock, Smoky Mts., Blaine Co., Aug. 13, 1916, *Macbride & Payson*, no. 3771; stony exposed ridges near base of Soldier Mt. Peak, Corral, Blaine Co., June 26, 1916, *Macbride & Payson*, no. 2899. NEVADA: Santa Rosa Mts., July 11, 1898, *Cusick*, no. 2028. CALIFORNIA: Cloud's Rest, Yosemite, 1872, *Gray*; summit Cloud's Rest, July 13, 1889, *Chesnut & Drew* (Univ. Cal. Herb.); Sonora Pass, 1887, *Brewer* (Univ. Cal. Herb.); mts. near Mt. Whitney, *Purpus*, no. 1636 (Univ. Cal. Herb.). OREGON: Pine Creek, Baker Co., Sept., 1879, *Cusick*.

Mertensia incongruens, spec. nov., planta 2–3 dm. alta fere glabra; caulibus plus minusve infirmis; basi ad apicem fere aequabiliter foliosissimis; foliis viridibus, margine minute adpresse ciliatis, radicalibus vel infra caulis medium ovato-lanceolatis basi in petiolum attenuatis 3.5–7 cm. longis, caulinis sessilibus ovatis acutis vel acuminatis circa 5 cm. longis 2 cm. latis; racemis subumbellatis fere semper terminalibus mediocriter congestis; pedicellis glabris; calyce fere 5-partito, laciniis paullo ciliatis fere oblongis obtusis vel vix acutis non superante 2 mm. longis; corollae tubo intus plus minusve villoso 5–6 mm. longo, limbo 6–8 mm. longo; stylo incluso. — IDAHO: Smoky Mts. near Russian John Ranger Station; Blaine Co., August 13, 1916, *Macbride & Payson*, no. 3759 (TYPE, Gray Herb.).

This plant, a member of the *Lanceolatae*, is related to *M. coronata* A. Nels. and allied species. That group, however, uniformly has linear or ovate-lanceolate very acute or acuminate calyx-lobes which are typically 3–5 mm. long in anthesis. The calyx lobes of *M. incongruens* are at once suggestive of the *Ciliatae* so that from this character alone its presence here seems almost incongruous. The subumbellate inflorescence, too, is distinctive.

MERTENSIA BAKERI Greene, var. **subglabra,** var. nov., foliis subtus glabris. — IDAHO: Josephus Lakes, Custer Co., Aug. 3, 1916, *Macbride & Payson*, no. 3544 (TYPE, Gray Herb.).

This variety was growing with *M. Bakeri*, var. *amoena*, and except for the absence of hairs on the lower leaf surfaces was not distinguishable. Its discovery is in accord with known variations of several species, as those of *M. lanceolata*, *M. Fendleri*, *M. foliosa*, and others, and indeed similar forms are to be expected sooner or later in every species. In the key to this group, Contrib. Gray Herb. xlviii. 5 (1916), this variety may be placed in contrast to *M. ovata*, as follows:

Pubescence minute, appressed; leaves ovate-lanceolate.....18. *M. ovata.*
Pubescence spreading, especially on pedicels and calyx lobes; leaves oblong-lanceolate.....19. *M. Bakeri,* var. *subglabra.*

MERTENSIA CILIATA (James) G. Don, var. **subpubescens** (Rydb.), comb. nov. — *M. subpubescens* Rydb. Bull. Torr. Club xxx. 261 (1903). In the treatment of this genus in Contrib. Gray Herb. xlviii. 10 (1916) this plant was retained as a species with the suggestion that perhaps it "should be regarded as a variety of *M. ciliata.*" Our field observations have convinced us that this is indeed the proper disposition as in every case our collections were growing with the typical form, and, except for the pubescence on the under surface of the leaves, were not distinguishable from it. Since the glabrous and pubescent states are now known to grow together it is not surprising that the type collection of *M. subpubescens* was mixed (cf. Contrib. Gray Herb., l. c. 11). The following specimens indicate a range extension, the variety heretofore having been known only from southwestern Montana and northern Wyoming. Number 3272 has pure white flowers and may be known as forma **candida,** f. nov., corolla alba. — IDAHO: Bear Creek below Parker Mt., July 17, 1916, *Macbride & Payson,* no. 3272 (Type of forma *candida*); also July 18, no. 3279; Clyde, July 10, no. 3119; Bonanza, July 28, no. 3492.

MIMULUS LEWISII Pursh, forma **tetonensis** (A. Nels.), comb. nov. — *M. Lewisii* Pursh, var. *tetonensis* A. Nels. Bot. Gaz. xxxiv. 31 (1902). — MONTANA: Summit, Great Northern R. R., July 25, 1894, *R. S. Williams* (in part). IDAHO: Bear Creek, near Challis, Custer Co., July 18, 1916, *Macbride & Payson,* no. 3284; Galena, Blaine Co., Aug. 12, 1916, *Macbride & Payson,* no. 3731. WYOMING: above Lee's Lake, July 26, 1901, *Merrill & Wilcox,* no. 1072.

Dr. Nelson, l. c., based his variety on two characters besides color but both of these — the degree of glandulosity and the shape of the calyx-lobes — are seen on the examination of a large series of specimens to be purely superficial. The name *tetonensis* may be retained, however, to designate a not infrequent white or nearly white condition which, when occurring with the typical state, presents a wonderful and striking contrast.

VERONICA CUSICKII Gray, var. **Allenii** (Greenm.), comb. nov. — *V. Allenii* Greenm. Bot. Gaz. xxv. 263 (1898). Corolla white, 6–7 mm. long. — WASHINGTON: near Paradise River, Mt. Rainier, *O. D. Allen,* no. 95a.

Typical *V. Cusickii* is common on Mt. Rainier and the variety possesses no noteworthy character except the color of the corolla. The plants are dwarf, the flowers not fully developed which probably accounts for the slightly less exserted stamens and style. *V. alpina* L. sometimes has white flowers (forma *albiflora* Rosenv.).

Veronica funesta, spec. nov., perennis; caulibus e basi repente simplicibus 1.5–3 dm. altis parce puberulis: foliis caulinis inferioribus petiolatis ellipticis vel fere orbiculatis paullo crenatis internodiis longioribus circa 1 cm. longis circa 7 mm. latis, caulinis superioribus sessilis ellipticis vel ovatis circa 1.5 cm. longis paucidenticulatis, internodiis 3–6 cm. longis; inflorescentia ut apud *V. Cusickii*; calycis fructiferi laciniis ovatis vel ellipticis obtusissimis parce strigosis circa 4 mm. longis plus minusve inaequalibus; corolla ignota post anthesin ut videtur circa 5 mm. lata. — Oregon: Swan Lake Valley, June 21, 1896, *Elmer I. Applegate*, no. 424 (Type, Gray Herb.).

This species, a member of the *Alpinae*, is closely related to *V. Cusickii* Gray and *V. Copelandii* Eastw. It differs from the former in its denticulate leaves, long upper internodes, broad obtuse calyx-segments and (apparently) much smaller flowers. The stems, too, are much more decumbent at base. *V. Copelandii* of northern California resembles it greatly in calyx-lobes but the leaves are pubescent and much longer than the internodes, and the character of the pubescence is not the same. Both Howell (Fl. N. W. Am.) and Piper & Beattie (Fl. N. W. Coast) describe *V. Cusickii* as " glabrous except the glandular inflorescence." As a matter of fact the type has a distinctly finely pubescent stem and so have all the half dozen specimens that we have examined. The collection by Greene referred by Gray, Syn. Fl. ii. pt. 1. 288 (1886), to his species, is *V. Copelandii* Eastw. Our number 3695 from above Red Fish Lake, Sawtooth Mts., Aug. 9, 1916 is the only collection of *V. Cusickii* we have seen from Idaho and apparently represents a range extension from the Blue Mts. of northeastern Oregon. *V. funesta* and *V. Copelandii* will probably be found to replace this species in southern Oregon and southward.

Castilleja robiginosa, spec. nov., humilis circa 1.5 dm. alta mediocriter piloso-hispida; caulibus mediocriter numerosis purpurascentibus simplicibus vel saepius ramosis; foliis viridibus vix scabrido-pubescentibus linearibus vel lineari-lanceolatis 1-nerviis 2–3 cm. longis, inferioribus integris, superioribus parce pinnati-

sectis; bracteis oblongo-ovatis 1.5–2 cm. longis ubique viridibus vel summis brunneo-flavis integris lobis lateralibus 4 linearibus 2 inferioribus 5 mm. longis, 2 superioribus 3 cm. longis; calyce 6–10 mm. longo antice et postice aequaliter fisso lobis apice bifidis; corolla flava 1.5–2 cm. longa, tubo 1–1.5 cm. longo, galea labium inferius paullo superante, labiis lobis obtusis 1.5 mm. longis. — IDAHO: dry sagebrush flat. Robinson Bar, Custer Co., July 23, 1916, *Macbride & Payson*, no. 3387 (TYPE, Gray Herb.).

The character of subequally cleft calyx and short galea place this plant in the group typified by *C. longispica* and *C. oresbia* and it is probably most closely related to these species in spite of the fact that the short calyx and long corolla suggest *C. curticalyx*. The habit is nearly that of *C. rustica* from which the short calyx and galea distinguish it.

Castilleja ardifera, spec. nov., stricta circa 5 dm. alta; caulibus plus minusve piloso-hispida imprimis ad apicem; foliis numerosis viridibus sed utrinque aliquid scabrido-pubescentibus 3-nerviis sine exceptione integris caulinis inferioribus lineari-lanceolatis acutis paullo reductis; bracteis oblongo ovatis integris inferioribus ubique viridibus vel saepius ad apicem coloratis, superioribus colore valde variabilibis sed plerumque flavis; calyce 15–23 mm. longo antice et postice subaequaliter fisso lobis apice dentatis; corolla circa 2 cm. longa, tubo circa 1 cm. longo, galea elongata calycem paululum vel multum superanti; labiis lobis acutis circa 1 mm. longis. — IDAHO: Cape Horn, Custer County, July 30, 1916, *Macbride & Payson*, no. 3524 (TYPE, Gray Herb.).

This species is very closely related to *C. lutescens*. The bracts and upper leaves of that species, however, are always trifid and the galea is less than one half as long as the tube. The entire leaves are suggestive of the group of closely related species typified by *C. confusa* but that group is characterized by red-colored bracts which are nearly always more or less cleft and by elongate galeas which much exceed the calyx. *C. ardifera* is remarkable in the fact that it at times displays great variation in the length of calyx but not in the length of corolla so that, although the corolla and calyx are usually subequal, the former is sometimes distinctly the longer.

The plants were common in the vicinity of Cape Horn where they grew in very wet meadow-lands and at once attracted notice by the marvellous variation in the color of the bracts. Although predominantly yellow these presented every conceivable tone of soft reds and even brown and white, so that the general color effect of a patch of the plants was indescribably pleasing.

ORTHOCARPUS HISPIDUS Benth., var. **tenuis** (Heller), comb. nov. — *O. tenuis* Heller, Muhl. i. 45 (1904). *O. rarior* Suksd. Allg. Bot. Zeit. xii. 27 (1906). — Eastern and southern Washington to Idaho, Nevada, and California. — IDAHO: common about Moscow, June 20, 1898, *Henderson*, no. 4611; Corral, Aug. 15, 1916, *Macbride & Payson*, no. 3833. NEVADA: Franktown, Washoe Co., June 28, 1909, *Heller*, no. 9784; King's Cañon, Ormsby Co., June 21, 1902, *Baker*, no. 1128; Carson City, 1865, *Anderson*, nos. 246, 181 & 236. CALIFORNIA: Chico, Butte Co., June 22, 1914, *Heller*, no. 11509; lower end of Donner Lake, Nevada Co., July 10, 1903, *Heller*, no. 6907 (TYPE). OREGON: Union Co., 1878, *Cusick*. WASHINGTON: Falcon Valley, Klickitat Co., June 28, 1897, *Suksdorf*, no. 2779 (type of *O. rarior*), — also July, 1880, nos. 465 & 466.

Although apparently the only difference between the type and its variety is one of color this is generally so distinctive that it seems to deserve varietal recognition. The bright yellow form may blossom somewhat later than *O. hispidus*. Our no. 2911 secured at Corral the last of June has white flowers and at that time the variety *tenuis* was not found. Upon our return, Aug. 15, we collected the variety in the same field where the typical white form was abundant on June 27. Constant technical differences of corollas and seeds, however, have been sought in vain.

PEDICULARIS GROENLANDICA Retz. Although Piper as long ago as 1901 suggested in *Mazama* ii. 100 that this species in typical form was confined to northeastern North America neither the "Flora of Colorado" nor the Coulter-Nelson Manual include the variety *surrecta* (Benth.) Piper, l. c. In their Flora of the Northwest Coast Piper and Beattie have taken up Bentham's species. Unfortunately for this treatment, typical *P. groenlandica* has been found in the Rocky Mountains and moreover there are some collections which are exactly intermediate between the western and eastern forms. In general, however, collections from the West have a very dense inflorescence and galea 10–15 mm. long, while specimens from Labrador all exhibit a rather open spike and a somewhat shorter galea (5–8 mm.). But proceeding westward across Canada there occur forms which, although possessing the short galea of the northeastern plant have the dense spike of the Rocky Mountain variety, and occasionally a Colorado collection exhibits a loosely flowered inflorescence when the galea is over one cm. long. The really fundamental difference, therefore, between

these two forms is in the length of galea and, as already suggested, even this varies but the two extremes are noteworthy especially when their respective ranges are considered. The plant with short galea, i. e. true *P. groenlandica* is the only form that occurs north and east of Montana and, although it extends south to California, the variety (judging from herbarium collections) replaces it by the ratio of 7–1. We would note in this connection that, singularly enough, the species is the more frequent form in Custer and Blaine Cos., Idaho. The variety, as represented by our no. 3746 from an alpine basin in the Smoky Mountains was found nowhere else, and the species, although common in the meadows of the region was not present in the basin. Our specimens of the variety were very distinctive in color as well as in galea-length from the typical form and possibly represent a color form of the variety. Since the variety and typical form of species have been confused it seems worth while to cite the following material of the latter in the Gray (Gr.) and Rocky Mountain (R. Mt.) herbaria. — LABRADOR: Makkovik, Aug., 1896, *A. Stecker*, no. 146 (Gr.); Okak, Aug. 8, 1892, *J. D. Sornborger*, no. 145 (Gr.); Okak, Aug., 1911, *F. C. Hinckley* (Gr.); Webeck Harbor, Aug. 4, 1891, *Bowdoin College Exp.*, no. 212 (Gr.). UNGAVA: Ungava Bay, 1884, *L. M. Turner*, no. 4821 (Gr.). SASKATCHEWAN: 1858, *Bourgeau* (Gr.). ALBERTA: Lake Louise, July 20, 1907, *Butters & Holway*, no. 177 (Gr.); Banff, June 28, 1903, *Barber*, no. 100 (Gr.); Banff, 1900, *Francis C. Prince* (Gr.); north of Lake Louise, July 25, 1904, *Macoun*, no. 67817 (Gr.). IDAHO: Payette Forest Reserve, 1912, *G. B. Mains* no. B–11 (R. Mt.); Five Mile Creek (Custer), Custer Co., July 27, 1916, *Macbride & Payson* no. 3479 (Gr. & R. Mt.). WYOMING: Warm Spring Creek, Fremont Co., Aug. 10, 1894, *Aven Nelson*, no. 806 (Gr. & R. Mt.). COLORADO: 1862, *Parry*, no. 250 (Gr.). UTAH: Fish Lake, Aug. 10, 1894, *Jones*, no. 5799 (R. Mt.). NEVADA: Carson City, 1865, *Anderson*, no. 3 (Gr.); Jarbidge, Corral Creek, July 12, 1912, *Nelson & Macbride*, no. 2049 (Gr. & R. Mt., approaches variety). CALIFORNIA: King's River Valley, 1877, *Dr. N. Matthews* (Gr.).

Hieracium absonum, spec. nov., *H. Howellii* affine; perenne, gracile, circa 4 dm. altum minusve plus cinereo-puberulum; foliis integerrimis viridibus radicalibus vel caulinis inferioribus oblanceolatis circa 1.5 dm. longis 1–1.5 cm. latis basi angustatis, in petiolum alatum contractis, apice subacutis, utrinque molliter cum pilis longissimis subapresse hirsutis (pilis non omnino fulvescentibus) etiam minute et crispe puberulis; foliis caulinis solum 1–2 similibus sed brevioribus; capitulis 4–7 laxe corymbosis; involucro cylindraceo circa 10 mm. alto; squamis subimbricatis lanceolatis

acutis plus minusve canescentibus et hirsutis; pappo mediocriter copioso sordido. — IDAHO: rather dry barren slopes, Sea Foam, Custer Co., Aug. 5, 1916, no. 3605 (TYPE, Gray Herb.).

Hieracium Howellii Gray is nearly this species but the single collection by which it is known has somewhat dentate leaves with tawny shaggy pubescence, tomentose stems and white pappus. The cinereous involucre suggests *H. cineritium* Nels. & Macbr. but it has numerous heads in a close corymbose cyme. The leaves, too, are denticulate.

V. A REVISION OF THE ERIGERONS OF THE SERIES MULTIFIDI

BY J. FRANCIS MACBRIDE AND EDWIN BLAKE PAYSON

THE nomenclature of the entirely homogenous group of *Erigeron* designated by Rydberg Fl. Colo. 359 (1906), as the *Multifidi* has always been more or less troublesome. This is largely due, doubtless, to the fact that mere variants have been proposed as new species, perhaps often because of the uncertainty of the character of type specimens, and by the fact that no consistent treatment of the group as a whole has ever been attempted.

The greatest development of species and varieties seems to be attained in the central Rocky Mountains of Colorado and Wyoming although representatives are exceedingly common on alpine slopes and meadows throughout western North America as far south as northern New Mexico and southeastern California. Though essentially alpine (or arctic) in habitat, individuals are often found descending to middle elevations on gravel bars and exposed stony slopes in mountain regions. Members of this section have been collected in Greenland and Spitzbergen as well as in the arctic portions of North America.

Three species are recognized and are distinguished by the manner in which the leaves are dissected, for this character seems to be fairly constant. The variation in the size of the heads, in the color of the rays and in the length and width of the leaf divisions, although often striking, constitute but formal differences. Most of the species and varieties that have been described in later years have been based on the presence or absence of pubescence

and ray flowers. In the present paper these characters have been considered as showing varietal differences only.

Theoretically every species might have four different varieties, two of which would be pubescent and two glabrous and of the two glabrous ones, one would be radiate and one discoid. Similarly there would be a radiate and a discoid variety of the pubescent pair. As a matter of fact all four combinations have been found in *E. compositus* and *E. trifidus*. In *E. pinnatisectus*, however, the pubescent character seems to be entirely lacking and so we find only two varieties — the radiate and the discoid.

Practically all individuals of *E. compositus* and *E. trifidus* develop cilia on the petioles and leaf margins and when a plant is spoken of as " glabrous " it is only the surface of the leaf-blades proper that are considered. Pubescent and glabrous forms merge but little and there is, in general, but little difficulty in separating them. Similarly, radiate and discoid varieties are easily separable, although forms appear that are intermediate. We have treated all forms as discoid in which the rays are not conspicuous. Specimens cited are in the Gray Herbarium unless followed by the abbreviation " R. Mt. Herb." indicating that they are in the Rocky Mountain Herbarium.

The only group-name which we know for this aggregation of species and varieties is the *Multifidi* of Rydberg, Fl. Colo. 359 (1906). Unfortunately the author has failed to indicate the status of this group in classification but from the fact that the name is given in the plural form and appears to be just above the rank of species it may well be considered as designating a series which may be defined as follows:

ERIGERON, series MULTIFIDI Rydberg, Fl. Colo. 360 (1906).

Perennial, cespitose, arctic and alpine herbs; leaves clustered on the very short stems; deeply ternately or pinnately dissected; petioles and leaf-margins generally ciliate (except in *E. pinnatisectus*); heads usually numerous, solitary on scapose peduncles, radiate or discoid: achenes pubescent.

Key to the Species and Varieties of the Series Multifidi

Leaves bi- or tri-ternately dissected.
  Leaf-blades glabrous except for cilia on petioles or margins.
    Heads radiate . . . . . 1. *E. compositus.*
    Heads eradiate . . . . . 1a. var. *incertus.*
  Leaf-blades hirsute.
    Heads radiate . . . . . 1b. var. *multifidus.*
    Heads eradiate . . . . . 1c. var. *petraeus.*
Leaves simply ternate or trifid.
  Leaf-blades hirsute.
    Heads radiate . . . . . 2. *E. trifidus.*
    Heads eradiate . . . . . 2a. var. *discoideus.*
  Leaf-blades glabrous.
    Heads radiate . . . . . 2b. var. *prasinus.*
    Heads eradiate . . . . . 2c. var. *deficiens.*
Leaves pinnately dissected, glabrous.
  Heads radiate . . . . . 3. *E. pinnatisectus.*
  Heads eradiate . . . . . 3a. var. *insolens.*

1. E. COMPOSITUS Pursh, Fl. Am. Sept. ii. 535 (1814). *E. compositus* Pursh, var. *glabratus* Macoun, Cat. Canad. Pl. ii, 231 (1883). *E. multifidus* Rydb., var. *nudus* Rydb., Mem. N. Y. Bot. Gard. i. 402 (1900). *E. Gormanii* Greene, Pitt. iv. 156 (1900). *E. compositus* Pursh, var. *nudus* (Rydb.) A. Nels. in Coulter & Nelson, New Man. R. Mt. Bot. 528 (1909). *E. compositus* Pursh, var. *breviradiatus* A. Nels. Bot. Gaz. liv. 416 (1912). — British Columbia and Alberta to southern Wyoming and Idaho. — ALBERTA: Devil's Lake, Banff, July 5, 1907, *Butters & Hollway*, no. 31; Squaw Mt., Banff, June 20, 1903, *Barber*, no. 273; near Banff, June 26, 1891, *Macoun*, no. 5221; vicinity of Lake Louise, July 7, 1915, *F. W. Hunnewell 2nd.*, no. 3869 (in herb. of collector). MONTANA: MacDougal Peak, July 31, 1908, *Mrs. Joseph Clemens* (in part). IDAHO: Upper Ferry, Clearwater River, near Lewiston, April 26, 1892, *Sandberg, MacDougal & Heller*, no. 48; Smoky Mts., Blaine Co., Aug. 13, 1916, *Macbride & Payson*, nos. 3760 & 3761; Custer, Custer Co., July 27, 1916, *Macbride & Payson*, no. 3455; Parker Mt., Custer Co., July 17, 1916, *Macbride & Payson*, no. 3248; Silver City, Owyhee Co., June 17, 1911, *Macbride*, no. 899 (type of var. *breviradiatus*). WYOMING: Golden Gate, Yellowstone Park, June 28, 1899, *A. Nelson & E. Nelson*, no. 5545 (R. Mt. Herb.); Big Horn Co., July 1906, *Worthley*, no. 112, in part (R. Mt. Herb.); Laramie Peak, Aug. 7, 1895, *A. Nelson*, no. 6112 (R. Mt. Herb.). BRITISH COLUMBIA: July 12, 1904, *Reuben T. Shaw*, no. 247; Chillinack Valley, Aug. 28, 1901, *Macoun*, no. 26441.

1a. E. COMPOSITUS Pursh, var. INCERTUS A. Nels. in Coulter & Nelson New Man. R. Mt. Bot. 528 (1909). *E. multifidus* Rydb., var. *incertus* A. Nels. Bot. Gaz. xxx. 198 (1900). *E. compositus* Pursh, var. *discoideus* A. Nels. in Coulter and Nelson New Man.

R. Mt. Bot. 528 (1909), not Gray, Am. Journ. Sci. ser. 2, xxxiii. 237 (1862). — British Columbia and Alberta to Wyoming and southern Idaho. — ALBERTA: Moraine Lake, July 8, 1915, *F. W. Hunnewell 2nd.*, no. 387c (in herb. of collector); near Banff, July 25, 1895, *Canby*; Devil's Lake, Banff, July 5, 1907, *Butters & Hollway*, no. 32. BRITISH COLUMBIA: Carbonate Draw, July 14, 1904, *Reuben T. Shaw*, no. 350. MONTANA: MacDougal Peak, July 31, 1908, *Mrs. Joseph Clemens*, in part. IDAHO: Antelope Mts., Blaine Co., near Martin, July 6, 1916, *Macbride & Payson*, no. 3061; alpine summit, Parker Mt., Custer Co., July 17, 1916, *Macbride & Payson*, no. 3260; slide rock, Smoky Mts., Blaine Co., Aug. 13, 1916, *Macbride & Payson*, no. 3762; Parker Mt., Custer Co., July 17, 1916, *Macbride & Payson*, no. 3306. WYOMING: Obsidian Creek, July 22, 1899, *A. Nelson & E. Nelson*, no. 6066; Canyon, July, 1904, *O. M. Oleson*, no. 138 (R. Mt. Herb.); Upper Basin, July 17, 1906, *W. S. Cooper*, no. 979 (R. Mt. Herb.).

1b. E. COMPOSITUS Pursh, var. **multifidus** (Rydb.), comb. nov.— *E. multifidus* Rydb., Mem. N. Y. Bot. Gard. i. 402 (1900). — Alberta to Colorado and southeastern California, thence north to Washington. — NORTH DAKOTA: near Minot, Aug. 2, 1903, *Waldron*, no. 1849 (R. Mt. Herb.). ALBERTA: Tunnel Mt., vicinity of Banff, June 30, 1915, *F. W. Hunnewell 2nd.*, no. 3871 (in herb. of collector). MONTANA: Red Lodge, July 28, 1893, *Rose*, no. 65 (R. Mt. Herb.); Bridger Mts., June 15, 1897, *Rydberg & Bessey*, no. 5089; near Missoula, June 12, 1901, *MacDougal*, no. 151. IDAHO: Silver City, Owyhee Co., June 26, 1911, *Macbride*, no. 988; Stevens Peak, Coeur D'Alene Mts., Aug. 5, 1895, *Leiberg*, no. 1468; Latah Co., April 18, 1896, *Henderson* (R. Mt. Herb.); Post Falls, May 17, 1909, *S. O. Johnson*, no. 85; Patterson, Lemhi Co., July 13, 1916, *Macbride & Payson*, no. 3197; Smoky Mts., Blaine Co., Aug. 13, 1916, *Macbride & Payson*, no. 3763; Parker Mt., Custer Co., July 17, 1916, *Macbride & Payson*, no. 3264; Lost River Mts., west of Clyde, Blaine Co., July 10, 1916, *Macbride & Payson*, no. 3140a. WYOMING: northwestern Wyoming, Aug. 9, 1893, *Rose*, no. 684 (R. Mt. Herb.); Snowy Range, Aug. 31, 1903, *Goodding*, no. 2066 (R. Mt. Herb.); Big Horn Co., 1906, *Worthley*, no. 138 (R. Mt. Herb.); Cooper Creek, June 5, 1898, *E. Nelson*, no. 4328 (R. Mt. Herb.); Golden Gate, June 2, 1899, *A. Nelson & E. Nelson*, no. 5545a (R. Mt. Herb.); Madison River, June 23, 1899, *A. Nelson & E. Nelson*, no. 5512 (R. Mt. Herb.). COLORADO: West Indian Creek, June 14, 1900, *Rydberg & Vreeland*, no. 5420 (R. Mt. Herb.); Rabbit Ear Mt., 1898, *Ruppert & Witter*, no. 55; Spicer, Larimer Co., July 10, 1903, *Goodding*, no. 1523; between Sunshine and Ward, Aug. 1902, *Tweedy*, no. 4917 (R. Mt. Herb.); Beaver Creek, Larimer Co., July 4, 1903, *Goodding*, no. 1445; Tolland, July 3, 1908, *Ramaley & Robbins*, no. 5209 (R. Mt. Herb.); Beaver Creek, July 4, 1896, no. 2891; 1906, *Johnson*, no. 324 (R. Mt.

Herb.); Boulder Park, Tolland, July 1, 1911, *Ramaley*, no. 8772 (R. Mt. Herb.); headwaters of Clear Creek and Crazy Woman River, July–Aug., 1911, *Tweedy*, no. 3009 (R. Mt. Herb.). UTAH: Marysvale, July 23, 1905, *Rydberg & Carlton*, no. 7094 (R. Mt. Herb.); Big Cottonwood Canyon, Aug. 8, 1902, *Cooper*, no. 325 (R. Mt. Herb.); La Sal Mts., June 14, 1914, *Payson*, no. 417 (R. Mt. Herb.); Little Cottonwood Canyon, Aug. 11, 1906, *Garrett*, no. 1942 (R. Mt. Herb.); Big Cottonwood Canyon, June 28, 1905, *Garrett*, no. 1306; Uintah Mts., July 2, 1902, *Goodding*, no. 1234; La Sal Mts., July 7, 1911, *Rydberg & Garrett*, no. 8672 (R. Mt. Herb.). NEVADA: Jarbidge, July 8, 1912, *Nelson & Macbride*, no. 1988 (R. Mt. Herb.); near Deeth, Elko Co., July 29, 1908, *Heller*, no. 9177; Mt. Rose, Washoe Co., July 28, 1909, *Heller*, no. 9866. CALIFORNIA: Mt. Dana, Tuolumne Co., July 17, 1907, *Robert A. Ware*, no. 2619c; Farewell Gap, 1897, *Purpus*, no. 5273; near Mineral King, Aug. 10, 1891, *Coville & Funston*, no. 1576. OREGON: summit of Mt. Scott, Klamath Co., Aug. 19, 1896, *Applegate*, no. 86. WASHINGTON: Spokane, May, 1893, *Sandberg & Leiberg*; Mt. Ranier, Aug. 1895, *Piper*, no. 2144; Spokane, June, 1892, *Henderson*, no. 2306; Spokane, May 16, 1896, *Piper*, no. 2289. YUKON: Carcross, July 16, 1914, *Eastwood*, no. 701.

1c. ERIGERON COMPOSITUS Pursh, var. **petraeus,** var. nov., foliis ciliato-hispidis; capitulis discoideis. — British Columbia and Alberta to northwestern Wyoming and southern California. — ALBERTA: Devil's Lake, Banff, July 5, 1907, *Butters & Hollway*, no. 28; Banff, June 12, 1906, *Butters & Rosendahl*, 1377. MONTANA: Red Lodge, July 28, 1893, *Rose*, no. 65 (R. Mt. Herb.). IDAHO: Payette Forest Reserve, 1912, *Mains*, no. D–38 (R. Mt. Herb.); Mackay, Custer Co., July 31, 1911, *Nelson & Macbride*, no. 1482 (R. Mt. Herb.); Parker Mt., Custer Co., July 17, 1916, *Macbride & Payson*, no. 3247; Squaw Creek, Custer Co., July 23, 1916, *Macbride & Payson*, no. 3381; Bonanza, Custer Co., July 28, 1916, *Macbride & Payson*, no. 3494; Soldier Mts., Blaine Co., June 26, 1916, *Macbride & Payson*, no. 2900; Smoky Mts., Blaine Co., Aug. 13, 1916, *Macbride & Payson*, 3765; Lost River Mts. west of Clyde, Blaine Co., July 10, 1916, *Macbride & Payson*, no. 3140 (TYPE, Gray Herb.). WYOMING: Cloud's Peak, 1897, *W. C. Knight* (R. Mt. Herb.); Little Goose Creek Hills, July 16, 1896, *A. Nelson*, 2343 (R. Mt. Herb.); vicinity of Big Horn Mts., July–Aug., 1897, *Williams* (R. Mt. Herb.); Golden Gate, Yellowstone Park, June 28, 1899, *A. Nelson & E. Nelson*, no. 5538a (also no. 5538, in part). UTAH: La Sal Mts., July 17, 1911, *Rydberg & Garrett*, no. 9022 (R. Mt. Herb.); La Sal Mts., July 15, 1912, *Walker*, no. 278; Mount Barette, July 26, 1905, *Rydberg & Carlton*, no. 7224; Kimball's, June 3, 1908, *Mrs. Joseph Clemens*. CALIFORNIA: Mt. Tallac, July 25, 1897, *Blasdale* (R. Mt. Herb.); Castle Peak, Nevada Co., Aug. 3, 1903, *Heller*, no. 7103; Lassen's

Peak, Sierra Co., 1875, *Lemmon*; Mt. San Barnardino, June, 1879, *Wright*. OREGON: Steins Mts., July 5, 1896, *Leiberg*, no. 2492; Pine Creek, southeastern Oregon, July, 1893, *Mrs. Austin* (R. Mt. Herb.). BRITISH COLUMBIA: Spencer's Bridge, May 19, 1875, *Macoun*, no. 888.

This variety, although seemingly only a discoid form of var. *multifidus*, apparently is not found in Colorado, a region where it would be expected on account of the prevalence of the rayed state. Our no. 3140a, representing the var. *multifidus* was collected only a few feet from the type of the var. *petraeus*, and Dr. Butters informs us that his specimens of both forms were growing on the same alpine slope.

2. E. TRIFIDUS Hook. Fl. Bor. Am. ii. 17. t. 120 (1834). — *E. compositus* Pursh, var. *trifidus* (Hook.) Gray; Proc. Am. Acad. xvi. 90 (1880). — Colorado to southwestern Montana and eastern Oregon; also Greenland. — GREENLAND: Herb. Hort. Bot. Hafn., *Rink*. MONTANA: Gallatin Co., June 11, 1901, *Jones*, (R. Mt. Herb); Great Falls, June 10, 1892, *Williams* (R. Mt. Herb); Madison Co., June 26, 1899, *A. Nelson & E. Nelson*, no. 5458; near Woodruff's Falls, Aug. 2, 1883, *Canby*. WYOMING: Head of Pole Creek, May 18, 1895, *A. Nelson*, no. 1217 (R. Mt. Herb.); Sand Creek, Albany Co., June 1, 1900, *A. Nelson*, no. 7007, in part; Ft. Bridger, June 9, 1898, *A. Nelson*, no. 4614a (R. Mt. Herb.); Laramie Hills, June, 1893, *A. Nelson*, no. 3239 (R. Mt. Herb.); Pole Creek, May 12, 1894, *A. Nelson*, no. 3816; Tepee Creek, July 9, 1909, *Willits*, no. 274 (R. Mt. Herb.). COLORADO: Ward, July 20, 1907, *Ramaley, Dodds & Robbins*, no. 3152 (R. Mt. Herb.); Dutch Lake, June 14, 1908, *Ramaley*, no. 4660 (R. Mt. Herb.); west of Ward, June 26, and June 11, 1908, *Ramaley & Robbins*, nos. 5043 & 4643 (R. Mt. Herb.); Gilpin Co., June–July, 1903, *Tweedy*, no. 5812 (R. Mt. Herb.); Golf Links, June 14, 1901, *F. E. & E. S. Clements*, no. 89; west of Fort Collins, June 14, 1898, *Crandall* (R. Mt. Herb.); Larimer Co., May 4, 1895, *Baker*, no. 5241 (R. Mt. Herb.), also *Osterhout* (R. Mt. Herb.); Eldora, Aug. 14, 1912, *Ramaley*, no. 9338 (R. Mt. Herb.); Ward, July 19, 1912, *Ramaley*, no. 9139 (R. Mt. Herb.); Marshall Pass, Aug. 20, 1901, *Baker*, no. 868; White House Mts., 1873, *Coulter*. OREGON: 1886, *Cusick*, no. 1402. WASHINGTON: Olympic Mts., *J. M. Grant*, no. 30 (not typical).

This species in typical form, is confined to the central Rocky Mountains and Washington material heretofore placed here is largely refereable to *E. compositus*, var. *multifidus*. We cite Grant's collection from the Olympic Mts. with great hesitancy.

Our specimen consists of a single small plant and more material may show it to represent an undescribed variety.

2a. E. TRIFIDUS Hook., var. DISCOIDEUS A. Nels. in Coult. & Nels. Man. R. Mt. Bot. 529 (1909). — Wyoming and Colorado. — WYOMING: Laramie Hills, June 4, 1899, *A. Nelson & E. Nelson*, no. 5400 (R. Mt. Herb.); Middle.Fork of Powder River, July 19, 1901, *Goodding*, no. 324 (R. Mt. Herb.); Steamboat Mts., Sweetwater Co., June 10, 1900, *Nelson*, no. 7088.

2b. E. TRIFIDUS Hook., var. **prasinus,** var. nov., foliis laminis glabris, petiolis ciliato-hispidis; capitulis radiatis, ligulis albis. — Black Hills, South Dakota to northern Colorado. — SOUTH DAKOTA: Cave Hills, Harding Co., Aug. 1, 1910, *F. D. Fromme*, no. 3; rim of Spearfish Canyon, June 18, 1910, *John Murdoch Jr.*, no. 4101. WYOMING: Laramie Peak, July 12, 1900, *A. Nelson* (R. Mt. Herb.); Cheyenne, May 1, 1902, *A. Nelson*, no. 8842; Sand Creek, Albany Co., June 1, 1900, *A. Nelson*, no. 7007 in part. COLORADO: Estes Park, Aug. 9, 1916, *Cooper*, no. 78, (R. Mt. Herb.) also May 18, 1908, no. 15 (R. Mt. Herb.); Frances, Boulder Co., July 18, 1907, *Ramaley*, no. 3273 (R. Mt. Herb.); near Ward, July 30, 1907, *Ramaley & Robbins*, no. 3103 (R. Mt. Herb.); Blue Bird Mine and Silver Lake, July 1, 1905, *Ramaley*, nos. 1181 and 1241 (R. Mt. Herb.); Tolland, July 15, 1912, *Ramaley*, no. 9119 (R. Mt. Herb.); Spicer, Larimer Co., July 10, 1903, *Goodding*, no. 1509 (TYPE, R. Mt. Herb., duplicate Gray Herb.).

The type of *E. flabellifolius* Rydb. Bull. Torr. Club. xxvi. 545 (1899), has not been seen but it seems to be a form of this variety depending on leaves which are " never compound but simply cleft two thirds their length or less."

2c. E. TRIFIDUS Hook., var. **deficiens,** nom. nov. *E. compositus* Pursh, var. *discoideus* Gray, Am. Journ. Sci. ser. 2, xxxiii. 237 (1862), not *E. trifidus* Hook., var. *discoideus* A. Nels. in Coulter & Nelson Man. R. Mt. Bot. 529 (1909). — COLORADO: alpine ridges lying east of Middle Park, 1861, *Parry*, no. 5 (type of *E. compositus*, var. *discoideus*); about Gray's Peak, July 30, 1885, *Patterson*, no. 62.

3. E. PINNATISECTUS (Gray) A. Nels. Bull. Torr. Club xxvi. 246 (1899). *E. compositus* Pursh, var. *pinnatisectus* Gray, Proc. Am. Acad. xvi. 90 (1881). — Colorado and southeastern Wyoming to northern New Mexico. — WYOMING: Medicine Bow Mts., Albany Co., Aug. 2, 1900, *A. Nelson*, no. 7854; La Plata Mines, Aug. 23, 1895, *A. Nelson*, no. 1816. COLORADO: west of Fort Collins, July 19, 1898, *Crandall* (R. Mt. Herb.); Boulder Co., 1896, *Mosely*, no. 307 (R. Mt. Herb.); near Breckenridge, Aug. 1901, *Mackenzie*, no. 32 (R. Mt. Herb.); Pagosa Peak, Aug. 6,

1899, *Baker*, no. 673 (R. Mt. Herb.); Mt. Garfield, July 15, 1901, *F. E. & E. S. Clements*, no. 497; Beaver Creek, July 4, 1896 and July 17, 1898, nos. 2897 and 2998; 1906, *Johnston*, no. 344 (R. Mt. Herb.); Estes Park, Aug. 2, 1906, *Cooper*, no. 38 (R. Mt. Herb.); Bald Mt., Boulder Co., July 20, 1907, *Ramaley, Dodds & Robbins*, no. 3237 (R. Mt. Herb.); near Ward, Boulder Co., July 30, 1907, *Ramaley & Robbins*, no. 3096; south of Ward, July, 1901, *Osterhout*, no. 2437 (R. Mt. Herb.); Long's Peak, July, 1905, *Johnston*, no. 74 (R. Mt. Herb.); Long's Peak, Aug. 3, 1904, *Cooper*, no. 221 (R. Mt. Herb.); Mt. Audubon, July, 19, 1908, *Dodds & Robbins*, no. 5858 (R. Mt. Herb.); Mosquito, 1873, *Wolf*; South Park, 1873, *Wolf & Rothrock*, no. 496; about Gray's Peak, July and Aug., 1885, *Patterson*, no. 60.

3a. E. PINNATISECTUS (Gray) A. Nels., var. **insolens,** var. nov., capitulis discoideis. — UTAH: above timber, La Sal Mts., July 15, 1912, *Walker*, no. 271 (TYPE, R. Mt. Herb., duplicate Gray Herb.); La Sal Mts., July 17 & 7, 1911, *Rydberg & Garrett*, nos. 8671 (R. Mt. Herb.) & 9023.

The typical form of the species has apparently never been collected west of the continental divide so this discoid variety, found, as yet, only in southeastern Utah, is exceedingly interesting.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

NEW SERIES.—No. L.

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II. New or critical Species or Varieties of Ranunculus. 135

III. Some Color-Forms of American Anemones. 139

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.— NEW SERIES, NO. L.

M. L. Fernald.

I. SOME POLYGONUMS NEW TO NORTH AMERICA.

Polygonum laxiflorum Weihe. In September, 1916, Mr. Bayard Long and the writer noticed in a roadside ditch at Bowdoinham, Maine, a *Polygonum* which had much the habit of *P. Hydropiper* L., with which it was growing, but which differed at first glance in its much deeper rose-colored or crimson flowers and somewhat broader leaves. Specimens were collected and upon study the plant proves to be *P. laxiflorum* Weihe, Flora, ix. 746 (1826), the plant which is frequently found in herbaria under the name *P. mite* Schrank. *P. mite*, however, according to Moss [1] is synonymous with *P. minus* Huds. So far as the writer can determine by close examination of all the material in the Gray Herbarium and the herbarium of the New England Botanical Club, *P. laxiflorum* has not heretofore been collected in America, but its abundance in the ditch at Bowdoinham indicates its thorough establishment there and the likelihood that, with attention especially directed to the plant, it will soon be found to be somewhat widely distributed with us. The plant, as above stated, resembles *P. Hydropiper* but has deeper-colored flowers; and it is at once separated by the fact that its perianth is strictly glandless and its achene smooth and lustrous, the perianth of *P. Hydropiper* being glandular-dotted and the achene punctate and opaque or dull.

[1] Moss, Camb. Brit. Fl. ii. 121 (1914).

Polygonum minus Huds. Fl. Angl. 148 (1762). This delicate species, closely related to *P. laxiflorum* above discussed, is not generally recognized as a North American plant but in the Gray Herbarium are two sheets from Lancaster County, Pennsylvania, which are clearly referable to it. The first collection was made on October 31, 1891, by Heller & Small in Smithville Swamp No. 2 and distributed by Heller as no. 652, *P. acre* HBK. The other collection was made by Mr. Heller on September 23, 1901, in a swamp two miles south of Refton and distributed as *P. punctatum,* var. *leptostachyum* (Meisner) Small. *P. minus* is a very slender species with glabrous perianths and lustrous achenes, much as in *P. laxiflorum* but very much smaller, the achenes only 1.5 mm. long, those of *P. laxiflorum* being 3 mm. long. The Lancaster County material exactly matches the plate in the Moss's *Cambridge British Flora* designated *P. minus,* var. *subcontiguum,* which is there ascribed to Wallich, Pl. Asiat. Rar. iii. 57 (1832). But Wallich neither published the plant under *P. minus* nor as var. *subcontiguum,* and in fact the treatment in Wallich's work was by Meisner. The variety was published as *P. strictum* All., var. *subcontinuum.* As a variety of *P. minus* it should be called

Polygonum minus Huds., var. **subcontinuum** (Meisn.), n. comb. *P. strictum,* var. *subcontinuum* Meisn. in Wallich, Pl. Asiat. Rar. iii. 57 (1832). *P. mite* * *strictum, b. pusillum* Fries, Fl. Suec. Mant. ii. 32 (1839). *P. minus,* var. *subcontiguum* Rouy, Fl. Fr. xii. 102 (1910.)— In this variety the spikes are very straight (not curving or drooping) and closely flowered, ranging in length from 1–2 cm.

Polygonum sagittatum L., forma **chloranthum**, n. f.— perianthiis viridibus.

Perianths green.— Maine: tidal mud-flats of Cathance River, Bowdoinham, September 14 & 19, 1916, *Fernald & Long,* no. 13,559 (type in Gray Herb.).

Throughout its range both in America and in Asia *P. sagittatum* normally has the flowers pink,— either deep rose-color or pale pink — or sometimes nearly white, but on the tidal flats of Cathance River the green-flowered form is very abundant and so uniform as to give a distinctive color to large areas of the flats. The plant is there so constantly green-flowered that it deserves at least formal recognition. The material gathered on September 19 was still in young flowering condition and in only a few heads are the achenes well formed. It is possible that the plant growing in this estuary, subject to regular

inundations, may be much less fertile than the ordinary pink-flowered plant of less inundated situations. That it has not completely lost its fertility, however, is shown by good achenes which are found in a few heads.

II. NEW OR CRITICAL SPECIES OR VARIETIES OF RANUNCULUS.

Ranunculus Pursh Richardson, var. **prolificus**, n. var., ramis valde adscendentibus 7–50-floris; foliis bracteiformibus simplicibus vel subsimplicibus numerosissimis, inferioribus 1–4 cm. longis.

Branches strongly ascending, 7–50-flowered: the simple or subsimple bracteal leaves numerous; the lower 1–4 cm. long.—Magdalen Islands: wet meadow, Grindstone, July 22, 1912, *Fernald, Bartram, Long & St. John*, no. 7482 (type in Gray Herb.).

Similar specimens referred in the herbarium sometimes to *R. Purshii*, sometimes to *R. sceleratus*, and by some collectors suggested as a hybrid of these two species, have been examined from Michigan and Montana. On the Magdalen Islands, where this plant forms a characteristic large colony in a meadow, no *R. sceleratus* has been found; and the plant there seems to be a definite, though extreme, variation from *R. Purshii*. In the typical form of the species the branches are prostrate or only slightly ascending and bear only 1–4 flowers, and the simple or subsimple bracteal leaves, when present, are rarely more than one or two in number and very small.

Ranunculus Flammula and R. reptans in North America.—Although often treated as a variety of *Ranunculus Flammula* L., *R. reptans* L. seems to merit recognition as a species. It is of general distribution in boreal regions, while *R. Flammula* of temperate Eurasia is known in North America only from southeastern Newfoundland, where it is associated with many other typical western European species unknown elsewhere in North America, and on the Pacific slope from southern British Columbia to California. Slender extremes of *R. Flammula* and the coarsest extremes of *R. reptans* somewhat simulate one another but all so-called transitional material seen by the writer is definitely referable to one or the other species in its floral characters and entirely consistent in geographic range. The usually stout ascending or merely trailing *R. Flammula* of Europe, Newfound-

land, and Pacific North America has the inflorescence, when well developed, a loose corymbose cyme with 2–30 flowers; the sepals are 3–4 mm. long; the broadly obovate or roundish petals 4–7 mm. long, 4–7 mm. broad, sessile or nearly so, 9–13-nerved; stamens 25–50; carpels 25–50, forming globose fruiting heads 3.5–5 mm. long; and the achenes are merely short-tipped. The slender, ordinarily filiform and repent branches of *R. reptans*, on the other hand, bear solitary flowers; the sepals are 2–2.8 mm. long; the petals narrowly obovate to oblong, 2.5–5 mm. long, 1–3 mm. broad, usually with a definite claw, 3–9-nerved; stamens 10–20; carpels 15–20, forming a hemispherical or spherical fruiting head 1.5–3 mm. long; and the achenes are distinctly beaked.

R. Flammula, var. *intermedius* Hook. has long passed as a plant transitional between *R. Flammula* and *R. reptans*, and in recent years it has been made to include very diverse elements. Thus, in the *Synoptical Flora* it is said to be the same as *R. Flammula*, var. *unalaschcensis* Ledeb., to have "akenes of the type or more beaked," and to occur from "Shore of Lake Ontario [1] to California and Oregon and northward. (N. Asia, Eu.) Largest forms from western coast, nearly approaching the type; very slender and linear-leaved as well as small broader-leaved forms pass into **Var. reptans**, E. Meyer." [2] Examination of the material upon which this statement was based shows that the Lake Ontario plant, the "very slender and linear-leaved" form, has the floral and achenial characters of *R. reptans;* the Newfoundland plant of Robinson & Schrenk is typical *R. Flammula;* and the California and Oregon material examined by Gray, the "largest forms from western coast", has the flowers and fruit, likewise, of *R. Flammula*. This variety, thus made up of elements belonging on the one hand to *R. Flammula*, on the other to *R. reptans*, was naturally described by Gray, as having "akenes of the type or more beaked." The status of this very mixed variety was well characterized in the 7th edition of Gray's *Manual*, where *R. Flammula* was said to pass "through an undefinable var. INTERMEDIUS Hook., into var. **reptans**." [3]

It is quite certain that, when he published his *R. Flammula*, var. *intermedius* [published as *intermedia*], Hooker had no thought of including the *R. Flammula* of the Pacific slope, for he distinctly wrote: "It does not appear that any of the varieties are found on the Rocky

"[1] Eastward to St. John's, Newfoundland, *Robinson & Schrenk*," etc.
[2] Gray, Syn. Fl. 1. pt. 1, 26, 27 (1895).
[3] Robinson & Fernald in Gray, Man. ed. 7, 395 (1908).

Mountains, nor to the westward of them."[1] Hooker had three varieties of *R. Flammula:* α *major* which is the endemic American *R. laxicaulis* (T. & G.) Darby; "β. *intermedia;* caule repente gracili, foliis anguste lanceolatis superioribus linearibus integerrimis"; and γ *filiformis,* which was typical *R. reptans* L. The two latter, vars. *intermedius* and *filiformis,* he had from "gravelly banks of rivers from Canada to lat. 69°." Thus it is clear that Hooker was merely separating from the true slender-leaved *R. reptans* (his *R. Flammula* γ *filiformis*) a broader-leaved but repent slender plant of Canadian river banks, a plant scarcely separable from *R. reptans,* but somewhat broader-leaved than the typical form of the species.

Similarly the name *R. Flammula,* var. *unalaschcensis* (Bess.) Ledeb. has been taken up for the western form of *R. Flammula,* but in the Gray Herbarium, where there are several sheets from the Aleutian Islands, there is none which is not clearly referable to *R. reptans,* either narrow- or broad-leaved. The only description of var. *unalaschcensis* was in Flora Rossica and there is nothing in it to indicate that it is more than an extreme of *R. reptans.* Ledebour recognized true *R. reptans* with filiform or filiform-linear leaves as *R. Flammula* γ and contrasted with it a var. "β. caule prostrato radicante, foliis latioribus integerrimis, rarius unidentalis" which included "*R. unalaschcensis,* Besser in *herb. Zeyheri.*"[2] This, judging from various specimens from Unalaska and the other Aleutian Islands, was, then, a form of *R. reptans.* This broad-leaved extreme of *R. reptans* is

R. REPTANS, var. OVALIS (Bigel.) T. & G. Fl. N. A. i. 16 (1838). *R. filiformis,* var. β. *ovalis* Bigel. Fl. Bost. ed. 2, 224 (1824). *R. unalaschcensis* Bess. in Ledeb. Fl. Ross. i. 32, as syn. (1841). *R. Flammula,* var. *unalaschcensis* (Bess.) Ledeb. acc. to Regel, Bull. Soc. Nat. Mosc. xxxiv. pt. 2, 41 (1861). *R. reptans,* var. *strigulosus* Freyn, Deutsche Bot. Monatschr. viii. 181 (1890).

RANUNCULUS PYGMAEUS Wahlenb., var. **petiolulatus,** n. var., foliis radicalibus pedatim divisis, foliolis 3 petiolulatis rhomboideo-obovatis palmatis laciniis 3–5 oblongis vel valde divisis; capitulis fructiferis 5–7.5 mm. longis.

Radical leaves pedately divided; the 3 leaflets petiolulate, rhombic-obovate, palmate, with 3–5 oblong lobes or deeply divided: fruiting heads 5–7.5 mm. long.— QUEBEC: damp mossy hollows in shade of amphibolite rocks, altitude 950–1000 m., Mt. Albert, Gaspé County, August 8 & 10, 1905, *Collins & Fernald,* no. 82 in large part (TYPE in Gray Herb.).

[1] Hook. Fl. Bor.-Am. i. 11 (1829).

[2] Ledeb. Fl. Ross. i. 32 (1842).

Typical *R. pygmaeus* of the Arctic regions, Labrador and the Canadian Rocky Mountains has the basal leaves merely lobed, not divided to the base, and the fruiting heads are 3–5 mm. long. In its basal leaves var. *petiolulatus* is quite like the rare Rocky Mountain species, *R. Grayi* Britton, but it has the small petals and achenes of *R. pygmaeus*. On Mt. Albert collections were made on two days at different points and all the material distributed under one number. The full sheet retained at the Gray Herbarium contains a few plants of true *R. pygmaeus*, but most of the specimens (presumably from a different station) are the variety.

Ranunculus pedatifidus J. E. Sm., var. **leiocarpus** (Trautv.), n. comb. *R. affinis* R. Br. in Parry, 1st Voy. Suppl. App. 265 (1824). *R. affinis*, var. *leiocarpa* Trautv. in Middendorf, Reise in Sibir. i. 62 (1847).

All the material seen by the writer from Arctic America, the Labrador Peninsula, and the Hudson Bay region, including a duplicate type of *R. affinis* from Melville Island, has glabrous achenes and characteristic pedately many-cleft basal leaves. In the Rocky Mountain region this plant is rare, the common plants there being true *R. pedatifidus*, with pedately cleft basal leaves and pubescent achenes, and var. *cardiophyllus* (Hook) Britton,[1] with the basal leaves mostly uncleft and merely crenate or dentate. In Siberia, too, there are apparently large areas where only the glabrous-fruited variety is found. This, at least, is indicated by Trautvetter's note: "In speciminibus taimyrensibus omnibus Ranunculi affinis R. Br. ovaria prorsus glabra sunt; attamen in herbario horti botanici Petropolitani inter specimina daurica ejusdem speciei nonnulla inveni, in quibus carpella aeque pilis prorsus carent."

Ranunculus repens L., var. **pleniflorus**, n. var., foliis basilaribus ternatis, foliolis suborbicularibus basi rotundatis vel subcordatis margine crenatis vel late obtuseque dentatis; floribus plenis.

Basal leaves ternate; the suborbicular leaflets rounded or subcordate at base, the margin crenate or with broad obtuse teeth: flowers double.— Frequent in old gardens, and tending to become naturalized in meadows, roadside-ditches, etc. Type: well established in meadows and along roadsides, Oneida, Herkimer County, New York, May 30, 1900, *J. V. Haberer*, no. 1530 in Gray Herb.

[1] Records of this plant from Quebec and Labrador seem to have been based on *R. Allenii* Robinson, Rhodora, vii. 220 (1905).

This plant is generally called in horticulture *R. repens*, var. *florepleno* but the latter name (if it can be accepted as a valid name) belongs to the double-flowered European form of *R. repens* with the bases of the leaflets cuneate to subtruncate, as in true *R. repens*, and the teeth and segments elongate and subacute to acuminate. The history of var. *pleniflorus* is obscure. It is found in old gardens and as a somewhat naturalized weed in eastern America; but such illustrations of the double-flowered *R. repens* of Europe as the writer has seen, as far back as Gerard's *Herball* (ed Johnson, 1633), where the plant is figured as *Ranunculus dulcis, multiplex*, and Besler's *Hortus Eystettensis* (1613) where it is called *Ranunculus hortensis, multiflorus*, show the characteristically cuneate-based leaflets of *R. repens*.

III. SOME COLOR FORMS OF AMERICAN ANEMONES.

Anemone riparia Fernald. This northern riverbank and shore species differs constantly from the more southern *A. virginiana* in several characters as well as its northern range and very early flowering season (from May to July). Contrasted with *A. virginiana* it has the leaf-segments usually more cuneate at base, although this character is by no means absolute; anthers 0.7–1.2 mm. long, those of the more southern *A. virginiana* running from 1.2–1.6 mm. long; its fruiting head 7–11 mm. thick, as contrasted with *A. virginiana* in which the heads are 1.2–1.5 cm. thick; and the subulate pale styles ascending or subascending in fruit, as contrasted with the firmer, more divergent styles of *A. virginiana*. The two species are sometimes confused in flower owing to the fact that each presents a distinctly sepaloid or a pronouncedly petaloid perianth. *A. riparia*, in fact, appears in three well pronounced forms as follows:

A. riparia Fernald, Rhodora, i. 51, t. 3. (1899), typical form.— Sepals petaloid, white; at least the inner broadly oblong to oval, with rounded tips, 1.3–2 cm. long, 0.8–1.5 cm. broad.— Calcareous or slaty ledges, rarely in swamps, Gaspé County, Quebec, to British Columbia, south to Cape Breton and Pictou County, Nova Scotia, King's County, New Brunswick, central Maine, Franklin County, Massachusetts, northern Fairfield County, Connecticut, Sullivan and Tompkins Counties, New York, northern Illinois, Minnesota, etc.— Flowers late May to July.

Forma **rhodantha**, sepalis rubris.

Sepals bright red.— QUEBEC: gravelly banks of the Grand River, Gaspé County, July, 1902, *George H. Richards* (TYPE in Gray Herb.).

Forma **inconspicua**, n. f., sepalis crassis coreaceis viridescentibus vel ochroleucis oblongo-acuminatis 0.7–1.3 cm. longis 2.5–5 mm. latis.

Sepals thick and leathery, greenish or greenish-white, oblong-acuminate, 0.7–1.3 cm. long, 2.5–5 mm. broad.— Range of the species, less common. As TYPE may be cited the sheet in the Gray Herbarium collected on cold walls of Percé Mountain, Percé, Gaspé County, Quebec, July 25, 1905, by *Williams, Collins & Fernald.*

ANEMONE VIRGINIANA L. As stated in the discussion of *A. riparia,* that species and *A. virginiana* are often confused through the fact that in both species either leathery greenish sepals or thin petaloid white sepals occur. In typical *A. virginiana* the sepals are leathery and greenish, the form with thin petaloid white sepals being comparatively rare. These two forms may be separated as follows:

A. VIRGINIANA L. Sp. Pl. i. 540 (1753), typical form.— Sepals leathery, greenish or greenish-yellow, very pubescent on the back, narrowly oblong, acuminate, 0.7–1.3 cm. long.— Dry slopes, dry or rocky open woods, or occasionally in meadows, common in the southeastern United States extending northward to Lakes Erie and Ontario and the lower Ottawa River, Ontario, Hochelaga County and Lake Memphremagog, Quebec, southern Coös County, New Hampshire, and Oxford and southern Penobscot Counties, Maine.— Flowers late June to late August.

Forma **leucosepala**, n. f., sepalis tenuibus albis petaloideis, majoribus vix pubescentibus obovatis apice rotundatis 1.2–1.7 cm. longis.

Sepals thinnish and petaloid, white; the larger ones scarcely pubescent on the back, obovate, rounded above, 1.2–1.7 cm. long.— Less common than the typical form. As TYPE specimen may be designated the plant collected on the north bank of the Swannanoa River near Biltmore, North Carolina, June 28 and August 9, 1897, and distributed from the *Biltmore Herbarium* as no. 54b (in Gray Herb.).

ANEMONE MULTIFIDA Poir. *Anemone multifida* as it occurs in North America seems to be conspecific but not strictly identical in all details with the Patagonian and Chilean type of the species, although some Rocky Mountain specimens seem scarcely separable from the South American. The plant in eastern America is extremely variable and falls rather clearly into two pronounced varieties, each of which presents noteworthy forms. These eastern American variants of the species may be separated as follows:

a. Sepals 5–10 mm. long: flowering stem 0.5–3 dm. high, 1–3-flowered. b.
b. Sepals yellowish-white within, yellowish, greenish or dull purplish outside, usually 5 ..... var. *hudsoniana.*
b. Sepals bright-red.
Sepals 5 ..... forma *sanguinea.*
Sepals very numerous (14–16) ..... forma *polysepala.*
a. Sepals 1.1–1.7 cm. long, usually 5 in number: flowering stem (1.5–) 3–7 dm. high, 1–5-flowered. c.
c. Sepals bright-red ..... var. *Richardsiana.*
c. Sepals milk-white ..... forma *leucantha.*

Var. HUDSONIANA DC. Syst. i. 209 (1817?). *A. Hudsoniana* Richardson in Franklin's Journ. 741 (1823).— Dryish slaty or calcareous ridges and gravel, local, eastern Newfoundland and Anticosti Island to the shores of Hudson Bay and westward, locally southward to Baie des Chaleurs, Quebec, Restigouche River, New Brunswick, St. John River and tributaries, New Brunswick and Maine, and Winooski River, Vermont.

Var. HUDSONIANA, forma **sanguinea** (Pursh), n. comb. *A. Hudsoniana β. Sanguinea* Richardson in Franklin's Journ. 741 (1823) based upon *A. sanguinea* Pursh ined. in herb. Lamb.— Of similar range, often more common.

Var. HUDSONIANA, forma **polysepala**, n. f., sepalis 14–16 — QUEBEC: banks of the Grand River, Gaspé County, June 20–July 10, 1903, *George H. Richards* (TYPE in Gray Herb.).

Var. **Richardsiana**, n. var., sepalis 1.1–1.7 cm. longis rubris saepissime 5; caulibus floriferis 3–7 dm. altis 1–5-floris.— QUEBEC: gravelly banks of the Grand River, Gaspé County, June 20–July 10, 1903, *George H. Richards* (TYPE in Gray Herb.), June 30–July 3, 1904, *M. L. Fernald;* banks of Restigouche River, Matapedia, June 28, 1904, *M. L. Fernald.*

Var. RICHARDSIANA, forma **leucantha**, n. f., sepalis lacteis.— QUEBEC: with the typical form, banks of the Grand River, Gaspé County, June 30–July 3, 1904, *M. L. Fernald* (TYPE in Gray Herb.).

IV. NEW SPECIES, VARIETIES AND FORMS OF SAXIFRAGA.

Saxifraga gaspensis, n. sp. *S. nivalem* simulans, differt foliis basilaribus angustioribus cuneato-obovatis basi angustatis subpetiolatis, apice acutis acute dentatis, 1.5–3 cm. longis 5–9 mm. latis; scapo gracile 1–7 cm. alto minute glanduloso-piloso; inflorescentia spicato-racemosa maturitate 1–2.7 cm. longa 3–5-flora; bracteis inferioribus oblongis vel ovatis acutis 5–8 mm. longis flores superantibus; pedicellis 2–3 mm. longis pilosis; tubo calycis viride hemisphaerico 1.5–2.5 mm. alto, lobis calycis oblongis vel anguste deltoideis fructu reflexis 1.8–2 mm. longis; petalis albis lanceolatis vel anguste ellipticis acutis vel subacutis 1.5–2 mm. longis 0.5–0.8 mm. latis; filamentis filiformibus subulatis purpurascentibus 1–1.2 mm. longis;

capsulis viridescentibus vel pallide brunneis 4 mm. longis, rostris foliculorum perbrevibus divergentibus.

Resembling *S. nivalis*, but the rosette-leaves more narrowly cuneate-obovate and more gradually narrowed to the broad petiolar base, acute at summit, 1.5–3 cm. long, 5–9 mm. broad, acutely dentate above the long-cuneate base: scape solitary, slender, 1–7 cm. high, minutely glandular-pilose: inflorescence spicate-racemose, in fruit 1–2.7 cm. long, 3–5-flowered: lower bracts oblong or ovate, acute, 5–8 mm. long, exceeding the flowers: pedicels 2–3 mm. long, pilose: calyx-tube green, hemispherical, 1.5–2.5 mm. high; calyx-lobes oblong or narrowly deltoid, reflexed in fruit, 1.8–2 mm. long; petals white, lanceolate or narrowly elliptical, acute or subacute, 1.5–2 mm. long, 0.5–0.8 mm. wide: filaments filiform-subulate, purplish, 1–1.2 mm. long: capsules greenish or pale-brown, 4 mm. long; the follicles with very short divergent beaks.— Quebec: very local, in sheltered pockets on abrupt western calcareous slopes, altitude 1000–1100 meters, Table-top Mountain, Gaspé County, August 5 and 12, 1906, *Fernald & Collins*, no. 600 (type in Gray Herb.).

Distributed as *S. nivalis*, from which it differs in many characters; *S. nivalis* having the leaves more rounded-oblong to round-obovate and narrowed to a more definite petiole and commonly much broader (0.7–3 cm.). The inflorescence of *S. nivalis* is usually more numerously flowered, varying from spiciform to corymbiform; its calyx-lobes are from 2–3 mm. long, spreading in fruit; its oblong petals are rounded at summit and 1.5–2.3 mm. wide; and its capsule is much larger, 5–7.5 mm. long. On Table-top Mountain the extremely local *S. gaspensis* was growing with other very localized species, *Carex rupestris* Allioni, *Pyrola grandiflora* Radius, *Pedicularis flammea* L., *Campanula uniflora* L. and *Senecio pauciflorus* Pursh.

Saxifraga nivalis L., var. **labradorica**, n. var., panicula corymbiformi laxa; floribus plerumque graciliter pedicellatis, pedicellis 3–10 mm. longis.

Panicle loosely corymbiform; the flowers mostly on slender pedicels 3–10 mm. long.— Labrador: Rama, August 20–24, 1897, *J. D. Sornborger*, no. 57 in part (type in Gray Herb.).

This is apparently the plant intended by Small in the *North American Flora* as *Micranthes tenuis*,[1] based upon *Saxifraga nivalis β. tenuis* Wahlenb. Fl. Lap. 114 (1812). Wahlenberg's variety went back to earlier species of Rottboel and of Martens which prove to be merely forms of *S. nivalis* in which the lower branch of the inflorescence is

[1] Small, N. A. Fl. xxii. 136 (1905).

slightly elongate, but the flowers, as in *S. nivalis*, are sessile or subsessile in glomerules and not slenderly pedicelled as in var. *labradorica*.

SAXIFRAGA VIRGINIENSIS Michx. In Essex County, Massachusetts, this species seems peculiarly subject to minor variations, four fairly distinguishable forms of the species there being found. In typical *S. virginiensis* the petals are white and the flowers and fruits pedicelled, the cymose branches of the panicle elongating in fruit. In the town of Andover, however, a singular form of the plant occurs; in fact, the only collections (3 in number) seen from Andover all belong to this peculiar form which may be called

S. VIRGINIENSIS, forma **glomerulata**, n. f., floribus sessilibus in glomerulis dispositis.

Flowers sessile in glomerules at tips of the branches.— MASSACHUSETTS: Andover, 1901, *A. S. Pease*, no. 672; ledges, Rabbit Rock Pond, Andover, April 27, 1902, *A. S. Pease*, no. 673; Prospect Hill, Andover, May 24, 1902, *A. S. Pease*, no. 671 (TYPE in Herb. New England Botanical Club).

In its sessile flowers borne in glomerules at the tips of the branches this singular form from Andover strongly suggests *S. nivalis* and by ordinary treatments of the genus in which *S. nivalis* is separated chiefly by its sessile flowers the Andover plant would fall readily into that species. *S. virginiensis* is distinguished, however, from *S. nivalis* by a number of characters which have not always been clearly recognized. In *S. nivalis* the bracts are from one-half to fully as long as the branches of the inflorescence; the calyx-lobes spreading in fruit; the petals 1.5–3.5 mm. long, about equaling or only slightly exceeding the calyx-lobes. In *S. virginiensis*, on the other hand, the bracts are many times shorter than the branches of the inflorescences; the calyx-lobes ascend in fruit; and the petals in the normal forms of the species are 4–5.5 mm. long, 2–3 times as long as the calyx-lobes.

Some aberrant forms of *S. virginiensis*, however, occur with the petals very small or wanting. These plants, of which two have been described as varieties, are not, however, varietal in character, seeming to occur merely as aberrant colonies within the range of the typical *S. virginiensis* and they should be treated rather as forms. The first is

S. VIRGINIENSIS, forma **chlorantha** (Oakes), n. comb. *S. virginiensis*, var. *chlorantha* Oakes in Hovey's Mag. xiii. 218 (1847), described as follows: "Petals pale green, instead of snow white, as in

the common variety. The margins and backs of the petals are also sprinkled with short hairs like those of the rest of the plant, but paler, and not so uniformly glandular. Topsfield, Mass., 1842."

The other variation was described from Manhattan Island, New York, but has been collected by the late J. H. Sears in Essex County, Massachusetts, at a station where the plant is said to be abundant. This is

S. VIRGINIENSIS, forma **pentadecandra** (Sterns), n. comb. *S. virginiensis*, var. *pentadecandra* Sterns, Bull. Torr. Bot. Club, xiv. 124 (1887) and xv. 166 (1888).— Petals replaced by stamens; the latter 15.— Originally described from Manhattan Island, New York, where the plant was extremely scarce; found in profusion on garnet slate rock between White's and Perkins's Hills, Essex County, Massachusetts, by *J. H. Sears*, May, 1898.

SAXIFRAGA PENSYLVANICA L., forma **fultior**, n. f., bracteis inferioribus dilatatis ovalibus 7–10 cm. longis 4–5.7 cm. latis.

Lower bracts dilated, oval, 7–12 cm. long, 4–5.7 cm. wide.— NEW HAMPSHIRE: bog on Gap Mountain road, Jaffrey, May 30, 1899, *E. F. Williams* (TYPE in Herb. New England Botanical Club); brookside, Fitzwilliam road, Jaffrey, May 30, 1899, *Rand & Robinson*, no. 826.

In typical *S. pensylvanica* the lower bracts are slender and many times shorter than the mature branches of the panicle, but in this extreme form from Jaffrey these dilated oval bracts are from one-half to two-thirds as long as the mature branches of the panicle and render the plant quite different in appearance from the typical almost naked-stemmed form.

V. A NEW VITIS FROM NEW ENGLAND.

For many years the writer has been familiar with a wild grape of the Penobscot Valley in Maine which it has been impossible satisfactorily to place with any of the defined species. An entirely similar vine from various other river valleys of northern and western New England has been collected and deposited in either the Gray Herbarium or the herbarium of the New England Botanical Club and from time to time these plants have been labeled by the great specialist upon American grapes, the late T. V. Munson, or by Prof. L. H. Bailey as *Vitis Labrusca* × *vulpina*. The vines in many ways are quite intermediate between the two species, *V. Labrusca* L. and *V. vulpina* L., having

the green foliage of the latter, the leaf-contour nearly of the former, the tendrils and inflorescences often continuous (that is, several in succession before an interruption) as in *V. Labrusca*, the grapes large as in the latter species but with the clear acid flavor without "muskiness" as in *V. vulpina*. The seed of this grape is quite as large as in *V. Labrusca* but somewhat more slender.

The disposition of this plant as a hybrid between *V. vulpina* and *V. Labrusca* has never been satisfactory to the present writer for the very practical reason that the intermediate vine occurs in great profusion as a river-thicket vine, climbing high over the trees of the alluvial banks, in river valleys where no plants of either of the supposed parent have ever been detected. In Maine *V. Labrusca* is confined to the coastal strip eastward to Penobscot Bay (and there very rare and local), extending inland to the Saco and lower Androscoggin Valleys. *V. vulpina*, on the other hand, is an extremely rare vine in Maine. It occurs from the mouth of the Aroostook River southward along the St. John in New Brunswick and is presumably found along the Aroostook River across the border in Maine. It is found in the valley of the Piscataquis (southeast of Moosehead Lake), in the valley of the Sandy River (southeast of the Rangely Lakes) and locally in the Androscoggin Valley and southward into York County. North of Maine it extends to Lake St. John and thence westward to the Rocky Mountains and it is broadly distributed from western New England southwestward.

The intermediate vine, as demonstrated by careful botanizing in the valleys of the St. John, Penobscot, Kennebec and some of the minor rivers of Maine during the summer of 1916 by Mr. Long and the writer, is the characteristic grape-vine in alluvial thickets throughout central and west-central Maine where no *V. Labrusca* is found and where no *V. vulpina* has been observed. It is a locally abundant vine along the main Penobscot northward as far as northern Penobscot County, along the Kennebec northward nearly to Moosehead Lake, along the Androscoggin into Coös County, New Hampshire, where, I am informed by Dr. A. S. Pease, no *V. Labrusca* is known; and the Gray Herbarium and the herbarium of the New England Botanical Club show characteristic specimens from southwestern Maine and northeastern Massachusetts and from the Connecticut Valley of New Hampshire, Massachusetts, and northern Connecticut.

Only in this latter valley and in the region from southern Maine

to eastern Massachusetts do all three species generally occur and it is quite possible that here the intermediate plant is of hybrid origin; but the specimens cited below from these regions are so exactly like those from central Maine, where the plant is the one wild grape of the river valleys and where it cannot readily be accounted for as a hybrid at least of recent origin, that the writer feels that the intermediate plant should be given specific recognition. Even though it may have been of hybrid origin in the long-distant past it has now become a thoroughly fixed and constant vine through a considerable area and demands the same recognition that is given other species of similarly intermediate characters but distinct ranges, such for instance as *V. Treleasei* Munson. The vine may be appropriately called

Vitis **novae-angliae**, n. sp., ab *V. vulpina* differt foliis rotundatis vel reniformi-ovatis obsolete 3-lobatis (dentibus late deltoideis vix prolongatis) subtus pilosis vel arachnoideis subglabratis vel ad nervos pilosis vel arachnoideis junioribus tomentosis tomento plus minusve rufescento; pampinis thyrsisque 2–8 continuis vel interruptis; baccis oblatis maturitate atropurpureis glaucis 1.2–1.7 cm. diametro; seminibus 6–7 mm. longis.

Differing from *V. vulpina* in having the leaves round or reniform-ovate, obscurely 3-lobed and with broad scarcely prolonged deltoid teeth, pilose, arachnoid or subglabrate beneath or with some pubescence persistent along the nerves; the young more or less rufescent-tomentose: tendrils and inflorescences 2–8, continuous or interrupted: berries oblate, in maturity black-purple, glaucous, 1.2–1.7 cm. in diameter: seeds 6–7 mm. long.— Alluvial or rich thickets, Maine and New Hampshire to Connecticut. Types collected in river-thicket by the Penobscot, Orono, Maine, June 27, 1906, in flower, *M. L. Fernald;* August 17, 1908, in well grown fruit, *M. L. Fernald;* and in late September, 1908, mature fruit, *Margaret Fernald Pierce* (all in Gray Herb.). Other specimens examined. Maine: margin of the Penobscot River, Winn, July 10, 1916, *Fernald & Long*, no. 14,063; river-thicket by the Penobscot, Orono, July 5, 1890, *M. L. Fernald*, 1891, *Kate Furbish;* low woods by Hermon Pond, Hermon, July 8, 1916, *Fernald & Long*, no. 14,062; alluvial thicket by Marsh Stream, Frankfort, July 21, 1916, *Fernald & Long*, no. 14,065; along the Kennebec, Carrying Place, Somerset County, July 29, 1892, *M. L. Fernald;* alluvial thickets by the Kennebec, Fairfield, July 24, 1916, *Fernald & Long*, no. 14,066; by Sebasticook River, Clinton, June 27, 1911, *R. C. Bean;* alluvial woods by the Kennebec, Vassalboro, July 6, 1916, *M. L. Fernald*, no. 14,061; steep bank by the sea, Rockland, August 22, 1909, *M. L. Fernald;* river-thicket, Sandy River, Farmington, September, 1892, and September, 1902, *C. H. Knowlton;* banks of Androscoggin River, Gilead, 1897, *Kate Furbish;* forming an extensive tangle, inner side of gravelly barrier bar, Gerrish Island,

Kittery, August 11, 1916, *Fernald & Long*, no. 14,068. NEW HAMPSHIRE: Androscoggin River, Shelburne, July 11, 1882, *Walter Deane;* roadside west of Gates Cottage, Shelburne, September 12, 1907, *A. S. Pease,* no. 10,798; climbing high over trees by the Androscoggin, Shelburne, September 27, 1916, *A. S. Pease*, no. 16,908; near Mascomp Lake, Enfield, August 22, 1878, *H. G. Jesup.* MASSACHUSETTS: Georgetown, August 9, 1907, *E. F. Williams;* Sudbury, September 2, 1885, *C. W. Swan;* roadside, North Wilbraham, May 16 & 18, 1913, *M. L. Fernald & F. W. Hunnewell, 2nd;* banks of Connecticut River, Hadley, July 1, 1874, *H. G. Jesup.* CONNECTICUT: banks of Connecticut River, South Windsor, October 8, 1890, *E. Watson.*

Although resembling *V. Labrusca* in its usually continuous tendrils and inflorescences, in the contour of the leaf as well as in the rufescent tomentum of the very young leaves, and in its large fruits and seeds, *V. novae-angliae* in no material examined shows any tendency to retain the tomentum as does *V. Labrusca,* except as an insignificant vestige along the nerves on the lower side of the leaves. Its fruit has a clear, sharp acid flavor and quite lacks any suggestion of the "muskiness" so characteristic of *V. Labrusca.* If the species were a hybrid of *V. vulpina* and *V. Labrusca* it is almost inconceivable that this peculiar flavor so characteristic of *V. Labrusca* should not appear in *V. novae-angliae.*

V. vulpina, which *V. novae-angliae* resembles in its green foliage and in its habitat in rich river-alluvium, has the more elongate leaves jagged-dentate with prolonged teeth; the young growth not rufescent; the tendrils and inflorescences with much more interrupted distribution; and the berries and seeds decidedly smaller.

VI. GENTIANA CLAUSA A VALID SPECIES.

In the *Synoptical Flora of North America* Gray clearly defined the corolla-characters separating *Gentiana Saponaria* L. and *G. Andrewsii* Griseb. In the former species, as stated by Gray, the corolla is "light blue, an inch or more long, its broad and roundish short lobes erect, little and often not at all longer than the 2-cleft and many-toothed intervening appendages"; while in *G. Andrewsii* the corolla is "as the preceding but more oblong and the lobes obliterated or obsolete, the truncate and usually almost closed border mainly consisting of the prominent fimbriate-dentate intervening appendages." [1]

[1] Gray, Syn. Fl. ii. pt. 1, 122 (1878).

That Gray clearly understood the two species is shown not only by his treatment in the *Synoptical Flora* but by the specimens which bear the labels inserted by him at that time. Subsequently, however, it has become a quite general practise to treat essentially all the large-leaved Closed Gentians of New England, northern and central New York and adjacent Canada as *G. Andrewsii,* presumably because of their very definitely "closed" corolla, although a few specimens from the northern states have been called *G. Saponaria.* A study of the northern material shows, however, that the common plant of New England and of many parts of the northern states and adjacent Canada is neither *G. Andrewsii* nor *G. Saponaria,* but is a distinct species combining the foliage-characters of *G. Andrewsii* with the corolla-characters nearly of *G. Saponaria.* This plant, which is apparently rare south of the northern states, extends along the mountains somewhat locally to North Carolina, occurring there only at the higher altitudes (Roan Mountain, etc.). This is the species which was well characterized (as Rafinesque's descriptions go) by Rafinesque as *G. clausa.*[1] Rafinesque's description was as follows:

"5. *G. Clausa* Raf. Closed Gentian. Stem round smooth, leaves ovate lanceolate, acuminate, subtrinerve: flowers verticillate, sessile; calix four to six cleft angular, segments foliaceous short: Corolla clavate, short, closed 8–10 teeth, internal teeth equally bilobe. On the Taconick and Green mountains, flowers blue, half the size of *G. Saponaria* and quite shut. Variety with ternate lanceolate leaves."

As above implied *G. Andrewsii* is a less common plant in New England than *G. clausa;* in fact, its representation in the Gray Herbarium and the herbarium of the New England Botanical Club indicates that it is extremely local, the only New England material found in these herbaria coming from eastern Massachusetts. Whether the plant is as local as this herbarium-representation implies of course can be determined only by further field-study, but it is significant that among the scores of herbarium sheets which have accumulated from the New England region practically all should prove to be *G. clausa* rather than *G. Andrewsii.*

G. Saponaria has been included in many New England lists but so far as the writer can determine this species is essentially a coastal plain plant extending northward along the coastal plain to Staten Island

[1] Raf. Med. Fl. i. 210 (1828).

and Long Island and occurring very locally in central New York. No New England material of it has been observed.

To summarize, the three plants which have been so generally confused in northeastern floras may be distinguished by the following key:

Corolla with nearly truncate summit; the firm true lobes nearly obsolete, narrowed at summit; the broader intervening thin prolongations of the membranous bands forming a fimbriate-dentate border.....*G. Andrewsii.*

Corolla with the broad rounded lobes 2–8 mm. long, as broad as or broader than the intervening 2–3-cleft appendages.

Leaves lanceolate to ovate-lanceolate, acuminate: involucre of 4–6 leaves; the 2–4 outer (except in dwarf specimens) subequal, 5–10 cm. long, 2–4 cm. broad: calyx-lobes herbaceous, oblong to obovate, finally spreading: corolla 2.5–4 cm. long, scarcely opening; the rounded lobes slightly incurved.....*G. clausa.*

Leaves oblong to elliptic, acute or obtuse, not acuminate: involucre of 2–4 leaves, the outer 3–6.5 cm. long, 0.7–2 cm. broad: calyx-lobes firm, linear to oblanceolate, ascending: corolla 3–5 cm. long, distinctly open; the rounded to subacute lobes erect.....*G. Saponaria.*

Further observation of the plants is required before the exact distribution in the northeast is known, but at present it may be stated as follows:

Gentiana Andrewsii Griseb.— Meadows, prairies, low thickets, banks of streams, etc., frequent in the southeastern states, extending locally northward and eastward to York, Frontenac and Carleton Counties, Ontario, Ottawa and Hochelaga Counties, Quebec, and eastern Massachusetts.

G. clausa Raf.— Borders of rich woods and thickets, banks of streams, meadows, etc., locally abundant from Kennebec County, Maine, to Lake Champlain, New York, and westward to western New York, southward to Bristol County, Massachusetts, Providence County, Rhode Island, southern Connecticut, and locally along the mountains to North Carolina.

G. Saponaria L.— Glades and sandy swamps of the coastal plain and piedmont regions north to Staten Island and Long Island, and very locally inland to Yates County, New York (*Sartwell*).

The writer has not seen fresh flowers of either *G. Andrewsii* or *G. Saponaria* but the fresh flowers of *G. clausa* are of a decided porcelain-blue color quickly changing in age or in drying to a rich blue-violet.

VII. SOME FORMS OF AMERICAN GENTIANS.

Gentiana Amarella L. Sp. Pl. i. 230 (1753). *G. acuta* Michx. Fl. Bor.-Am. i. 177 (1803). *G. plebeja* Cham. ex Bunge, Moscou Soc. Nat. Hist. Nouv. Mém. i. 250, t. 9, fig. 5 (1824). *G. Amarella*, var.

acuta (Michx.) Herder, Act. Hort. Petrop. i. 428 (1872). *Amarella acuta* (Michx.) Raf. Fl. Tellur. iii. 21 (1836). *A. plebeia* (Cham.) Greene, Leaflets, i. 53 (1904). *A. Amarella* (L.) Cockerell, Am. Nat. xl. 871 (1906).— I am unable to discern any constant differences between the American and the European plant. The differences maintained by Grisebach all fail in a good series of specimens. Grisebach's statement, under *G. acuta,* was as follows:

"This species is extremely like our *G. Amarella;* it seems, however, to differ constantly in the way the leaves embrace the stem. In *G. Amarella* the lamina of the two leaves ends at that point where they are affixed to the stem, so that they are separated from each other by an interstice formed by the stem; while in *G. acuta* the bases of both leaves touch each other without any interstice, so that the substance of the leaves itself is somewhat connate: this character seems to be invariable throughout all those numerous forms in which these species are so rich; the upper leaves of *G. acuta* are, besides, always longer and more acute, and the leaves near the root are more or less spathulate, while in *G. Amarella* the leaves are always more equal in the same individual; the beard of *G. acuta* is longer and thinner, so as to disappear almost wholly here and there; the flowers are somewhat smaller; the calyx is shorter and more unequal; the stem more angular, and commonly almost winged. Besides, most of its forms are much stiffer, taller, and more branched; the stem often produces such slender and numerous branchlets from the under axillae as has been mentioned above of *G. propinqua.*" [1]

As stated, every one of these points urged by Grisebach fails, and many American specimens are closely matched in all details by European specimens.

Gray stated that var. *acuta* has the "crown usually of fewer and sometimes very few setae," [2] and Engelmann that it has 5-parted flowers while "The true European *G. Amarella* has usually 4-parted flowers"; [3] but examination of plates of the European plant, if specimens are not available, quickly disposes of the latter point, for the European, like the American, has frequently 5-merous flowers. And the crown of nearly all American material is quite as fully developed as in the European; in fact most specimens have essentially identical crowns.

[1] Grisebach in Hook. Fl. Bor.-Am. ii. 64 (1838).
[2] Gray, Syn. Fl. ii. pt. 1, 118 (1878).
[3] Engelm. in Wheeler Exped. Rep. vi. Bot. 195 (1879).

Attempts have been made to distinguish the American from the Old World plant by the more acute corolla-lobes and smaller seeds, but abundant specimens show these characters to fail and this was realized as early as 1862 by Engelmann when he wrote: "*G. acuta* is evidently but a form, a geographical variety of *G. Amarella*, as Dr. Hooker has indicated, and which is confirmed by our dwarf variety and other forms collected in Colorado....; the characters of acutish lobes of the corolla and small seeds do not hold good; Dr. Parry's No. 307 has seeds as large as *G. Amarella* from Prussia, and several forms have quite obtuse lobes." [1]

Nearly all authors have agreed that *G. acuta* and *G. plebeja* are identical and in view of this fact it is worthy of note that Chamisso himself did not publish *G. plebeja*. It was published by Bunge in 1824 as "*G. plebeja* Chamisso in litteris"; but promptly, in 1826, Chamisso & Schlechtendal repudiated the species, placing it unequivocally under *G. Amarella* and saying: "Huic speciei addinus Gentianam in herbosis insulae Unalaschka lectam olinque sub nomine G. plebejae a Chamissone cum amicis communicatam." [2]

Although *G. acuta* does not differ even varietally from *G. Amarella* it is noteworthy that Michaux's type material collected at Tadousac in eastern Quebec was not the common lilac-flowered form of the plant but a somewhat unusual form with the flowers creamy-white or yellowish, or, as described by Michaux "viridi-lutei." This ochroleucous form is occasional about the Gulf of St. Lawrence, sometimes occupying habitats by itself, sometimes with the more common lilac-flowered *G. Amarella*. It is a striking color-variation but, in view of the fact that the name *G. acuta* has been so generally used in the specific or varietal sense, it would be highly misleading to perpetuate the descriptive name *acuta* for a form which is characterized only by its yellowish flowers and not by any other differences. This ochroleucous form may, therefore, be designated

G. AMARELLA L., forma **Michauxiana**, n. nom. *G. acuta* Michx. Fl. Bor.-Am. i. 177 (1803), in the strict sense.— Corolla ochroleucous.

G. QUINQUEFOLIA L., forma **lutescens**, n. f., lobis corollae ochroleucis.

Corolla-lobes ochroleucous.— Occasional in the range of the typical lilac-flowered form. As TYPE may be designated material in

[1] Engelm. Trans. St. Louis Acad. Sci. ii. 214 (1862).
[2] Cham. & Schl. Linnaea, i. 181 (1826).

the Gray Herbarium, collected in Chester County, Pennsylvania, by *T. C. Porter*, November 2, 1886.

G. CRINITA Froel., forma **albina**, n. f., lobis corollae albis.

Corolla-lobes white.— Occasional with the typical blue-flowered form. TYPE: Waverley, Massachusetts, September, 1894, *T. D. Bergen* (in Gray Herb.).

G. LINEARIS Froel., forma **Blanchardii**, n. f., lobis corollae albis.

Corolla-lobes white.— Occasional in the range of the species. TYPE in Gray Herbarium, collected on open roadside, Woodford, Vermont, August 15, 1902, *W. H. Blanchard.*

White-flowered forms of the other closed Gentians undoubtedly occur but so far as the writer has seen they have been collected only in this species and in *G. Andrewsii* (forma *albiflora* Britton).

VIII. SOME NEW OR CRITICAL PLANTS OF EASTERN NORTH AMERICA.

HIEROCHLOA ODORATA (L.) Wahl., var. FRAGRANS (Willd.) Richter, forma **Eamesii**, n. f., panicula elongata 2–4 dm. longa, ramis paucis remotis.

Panicle elongate, 2–4 dm. long, with few elongate branches.— CONNECTICUT: border of cultivated field beside salt-marsh, Fairfield, May 13, 1910, *E. H. Eames*, no. 8339; field bordering salt-meadows in rich soil, May 27, 1914, *E. H. Eames*, no. 8734 (TYPE in Gray Herb.).

The common plant of boreal North America and the northeastern coast is not true *H. odorata* of the Old World and of the Rocky Mountain region, but is a pronounced variety, so well marked that by Willdenow, Pursh, Roemer & Schultes and other authors early in the 19th century it was considered a distinct species: *Holcus fragrans* Willd. Sp. Pl. iv. 936 (1805), Pursh, Fl. Am. Sept. i. 78 (1814); *Hierochloa fragrans* (Willd.) R. & S. Syst. ii. 514 (1817). Willdenow, however, surmised that it might be a variety, saying: "*Simillimus praecedenti* [*Holcus odoratus*] *differre tamen videtur*, calyce *floribus multo longiore*, corollis *margine non villoso-ciliatis* et flore *hermaphrodito apice laevi. An varietas* ? W." In western North America where true *Hierochloa odorata* abounds the two varieties clearly intergrade as they do in northern Europe.

Dr. Eames's extreme form of var. *fragrans* was distributed as

Savastana Nashii Bicknell, Bull. Torr. Bot. Cl. xxv. 104, t. 328 (1898), subsequently transferred to *Hierochloa* as *H. Nashii* (Bicknell) Kaczmarek, Am. Midl. Nat. iii. 198 (1914);[1] but the Eames material is clearly an extreme development of *H. odorata*, var. *fragrans* rather than the beautifully distinct *H. Nashii*. The latter species has very elongate firm and enduring cauline leaves and flowers in July and August. *H. odorata*, on the other hand, flowers in the eastern states in May and June and by July the short lanceolate soft cauline leaves as well as the culms are quite shriveled and brown.

CYPERUS FILICINUS Vahl, var. **microdontus** (Torr.), n. comb. *C. microdontus* Torr. Ann. Lyc. N. Y. ii. 255 (1836).

C. filicinus Vahl (1806) must displace *C. Nuttallii* Eddy (1820). But the writer is unable to find any absolute character by which to separate *C. microdontus* specifically from it. Typical *C. filicinus* has the scales of the spikelets 2.5–3.5 mm. long, while *C. microdontus* has them only 2 mm. long, but occasionally colonies show scales intermediate in length and clearly bridging the gap between the two. In general, *C. filicinus* prefers saline or brackish habitats but is occasionally found in dune-hollows and other nearly fresh situations. In southeastern Massachusetts, at least, var. *microdontus* seems to be characteristic of fresh sandy pond-shores.

STENOPHYLLUS CAPILLARIS (L.) Britton. *S. capillaris* presents two strikingly different variations which do not seem to have been recognized. In the typical form of the species the spikelets are 5–10 (rarely –20)-flowered, 2.5–7 mm. long, commonly ferruginous, occasionally blackish; all but the central (except in dwarfed plants with reduced inflorescences) commonly on slender pedicels up to 1.5 cm. long; and basal inflorescences are wanting or few and mostly on definite culms. This plant is common in the southern states and extends northward to Schenectady County, New York, northern Vermont, Coös County, New Hampshire, and Kennebec and southern Penobscot Counties, Maine. In the northern half of the range, from Missouri and Virginia northward, there often occurs a plant which in its well developed

[1] Kaczmarek makes the point that, if the American Code throws aside the generic names *Gillenia* Moench, Meth. Suppl. 286 (1802) and *Elodea* Michx. Fl. Bor.-Am. i. 20 (1803) on account of the earlier *Gillena* Adans. Fam. ii. 166 (1763) and *Elodes* Adans. l. c. 444 (1763), followers of that code should also discard the name *Savastana* Schrank, Baier. Fl. i. 100, 337 (1789) because of the earlier *Savastania* Scopoli, Introd. 213 (1777).

extreme appears quite distinct but which clearly passes into typical *S. capillaris*. This is

Stenophyllus capillaris (L.) Britton, var. **cryptostachys**, n. var., spiculis 12–56-floris 4–10 mm. longis plerumque nigrescentibus vel pullis sessilibusque; inflorescentiis basilaribus confertis sessilibus.

Spikelets 12–56-flowered, 4–10 mm. long, commonly blackish or dark-brown and sessile (or only 1 or 2 on short rays): basal inflorescences crowded, closely sessile.— Missouri and Virginia north to Ohio and New England. Type: sandy woods, Monteer, Missouri, October 9, 1910, *B. F. Bush*, no. 6398c (in Gray Herb.).

Carex echinata Murr. Prodr. Fl. Goth. 76 (1770); Britten, Journ. Bot. xlv. 163 (1907); Briq. Prodr. Fl. Corse, i. 199 (1910); not Murr. herb. nor Kükenthal and others. *C. Leersii* Willd. Fl. Berol. Prodr. 28 (1787). *C. stellulata* Good. Trans. Linn. Soc. ii. 144 (1794).— The nomenclature of this species has been most distressingly confused and it is apparent that many botanists have not seen or interpreted in their full significance the above cited notes by Messrs. James Britten and Jean Briquet. Murray, in publishing *C. echinata*, gave absolutely no original description but cited a description of Haller's and a plate in Flora Danica, both of which are unquestionably the plant which was later called *C. Leersii* Willd. or *C. stellulata* Good. Murray's treatment was as follows: "*Carex echinata* mihi f. Car. spicis ternis echinatis glumis lanceolatis, capsulae mucrone simplici Hall. Hist. n. 1366. Oed. Dan T. 284." As distinctly pointed out by James Britten (l. c.), and again by Briquet (l. c.), the fact, that Murray had specimens as *C. echinata* which are not the species described by him under that name, in no way invalidates the use of the name for the plant actually described.

Decodon verticillatus (L.) Ell., var. laevigatus Torr. & Gray, Fl. i. 483 (1840), described as "glabrous; leaves bright green" as contrasted with var. *pubescens* Torr. & Gray, l. c. with "stem and lower surface of the leaves more or less tomentose-pubescent," is a well marked geographic variety. Var. *pubescens* shows a strong inclination to follow the coastal plain and related areas, while var. *laevigatus* is rare or local in the coastal plain region but more general inland. As represented in the Gray Herbarium the two varieties have the following ranges.

Var. pubescens.— Florida to Maine, chiefly on the coastal plain or on the outwash plains of southern New England, extending inland to northwestern Georgia, and in New England to Hampden County,

Massachusetts, and southern Kennebec and southern Penobscot Counties, Maine; also St. Clair County, Illinois to northeastern Illinois, northern Indiana, and southwestern Ontario.

Var. LAEVIGATUS.— Central Illinois and the upland of Tennessee and southwestern Virginia, north to central Wisconsin, western and northern New York, northern Vermont, Grafton County, New Hampshire, and Franklin County, Maine.

ASTER CORDIFOLIUS L., var. **racemiflorus**, n. var., a forma typica recedit foliis cordatis argute dentatis sinu clauso; capitulis valde racemosis, racemis lateralibus divergentibus vel flexuoso-recurvatis.

Differing from the typical form of the species in having the cordate leaves coarsely dentate, and the sinus closed: heads conspicuously racemose; the lateral racemes divergent or flexuous-recurved.— PRINCE EDWARD ISLAND: roadside-thickets and borders of dry woods, Malpeque, August 29, 1912, *Fernald, Long & St. John*, no. 8135 (TYPE in Gray Herb.).

In typical *Aster cordifolius* the cordate leaves are serrate and with an open sinus, and the inflorescence is definitely paniculate, the ascending or spreading branches paniculate-forking.

SENECIO FERNALDII Greenman, Ann. Mo. Bot. Gard. iii. 90 (1916). This little species of the limestone barrens of Table Mountain, Port à Port Bay, Newfoundland, was based by Greenman upon a single specimen. Further material collected by Dr. St. John and the writer in July, 1914 (no. 10,873) shows the species to range from 5–13 cm. in height; the blades of the coriaceous mostly purple-tinged basal leaves to range from narrowly cuneate-obovate to reniform and 0.3–2 cm. long, 0.5–1.5 cm. broad, and to have rounded or acute dentations or even to be lyrate-pinnatifid. The corollas, undescribed by Greenman, have a deep-orange to almost scarlet limb; the tube bears 5 dark stripes up to the sinuses and the lobes are bordered by a similar dark line, and in the expanded flowers the anthers are conspicuously exserted.

Like most of the other species of *Senecio* with discoid heads *S. Fernaldii* has a form with well developed rays, in this case the ligules being broadly oblong, 6 mm. long, 3–3.5 mm. broad, with 3 rounded terminal teeth and 4 dark longitudinal lines. This form may be called

SENECIO FERNALDII Greenman, forma **lingulatus**, n. f., lingulis oblongis 6 mm. longis 3–3.5 mm. latis longitudinaliter 4-lineatis apice 3-dentatis dentibus rotundatis.— NEWFOUNDLAND: very scarce, with the typical discoid form of the species, dry exposed ledges and shingle on the limestone tableland, altitude 200–300 m., Table Mountain, Port à Port Bay, July 16 & 17, 1914, *Fernald & St. John*, no. 10,873a (TYPE in Gray Herb.).

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TO THE

CONTRIBUTIONS FROM THE GRAY HERBARIUM

New Series, Vol. 2 (Nos. 26–50)

Compiled by

Mary A. Day and Hazel M. Brown

Names of new species are in **full face** type. The Roman numeral gives the number of the Contribution, the Arabic the page.

Those who wish to put these Contributions into the form which will permit the easiest reference, will do well to have them bound in their proper sequence and then enter upon each page in Roman numerals the number of the Contribution to which it belongs. This will be found to facilitate greatly the use of the Index.

In citing such of these Contributions as have been published in serials it is strongly recommended that the name of the original journal should be given, together with the volume, page, and date. For example: *Stachys Pringlei* Greenman, Proc. Am. Acad. xli. 245 (1905), *not* Contributions from the Gray Herbarium, new series, xxxi. 245 (1905). Numbers 47–49, on the other hand, were published independently and should be cited under the title of the series.

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